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THE NEW INTERNATIONAL ENCYCLOPÆDIA

SECOND EDITION

VOLUME XIX

NEW YORK
DODD, MEAD AND COMPANY
1917

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KEY TO PRONUNCIATION

For a full explanation of the various sounds indicated, see the Key to Pronunciation in Vol. I.

ā as in ale, fate.
ā̇ “ “ senate, chaotic.
â “ “ glare, care, and as *e* in there.
ă “ “ am, at.
ä “ “ arm, father.
ȧ “ “ ant, and final *a* in America, armada, etc.
a “ “ final, regal, pleasant.
a̤ “ “ all, fall.
ē “ “ eve.
ē̇ “ “ elate, evade.
ĕ “ “ end, pet.
ẽ “ “ fern, her, and as *i* in sir, etc.
e “ “ agency, judgment.
ī “ “ ice, quiet.
ī̇ “ “ quiescent.
ĭ “ “ ill, fit.
ō “ “ old, sober.
ō̇ “ “ obey, sobriety.
ô “ “ orb, nor.
ŏ “ “ odd, forest, not.
o “ “ atom, carol.
oi “ “ oil, boil.
o͞o “ “ food, fool, and as *u* in rude, rule.
ou “ “ house, mouse.
ū “ “ use, mule.
ū̇ “ “ unite.
ŭ “ “ cut, but.
ụ “ “ full, put, or as *oo* in foot, book.
û “ “ urn, burn.
y “ “ yet, yield.
ʙ “ “ Spanish Habana, Córdoba, where it is like English *v* but made with the lips alone.

ch as in chair, cheese.
ᴅ “ “ Spanish Almodovar, pulgada, where it is nearly like *th* in English then.
g “ “ go, get.
ɢ “ “ German Landtag = *ch* in Ger. ach, etc.
ʜ “ *j* in Spanish Jijona, *g* in Spanish gila; like English *h* in hue, but stronger.
hw “ *wh* in which.
ᴋ “ *ch* in German ich, Albrecht = *g* in German Arensberg, Mecklenburg, etc.
n̲ “ in sinker, longer.
ng “ “ sing, long.
ɴ “ “ French bon, Bourbon, and *m* in the French Étampes; here it indicates nasalizing of the preceding vowel.
sh “ “ shine, shut.
th “ “ thrust, thin.
ᴛʜ “ “ then, this.
zh “ *z* in azure, and *s* in pleasure.

An apostrophe ['] is sometimes used as in tā′b'l (table), kăz″m (chasm), to indicate the elision of a vowel or its reduction to a mere murmur.

For foreign sounds, the nearest English equivalent is generally used. In any case where a special symbol, as ɢ, ʜ, ᴋ, ɴ, is used, those unfamiliar with the foreign sound indicated may substitute the English sound ordinarily indicated by the letter. For a full description of all such sounds, see the article on Pronunciation.

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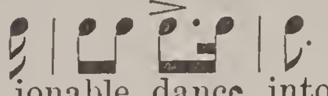
THE NEW INTERNATIONAL ENCYCLOPÆDIA

POLK, pōk, FRANK LYON (1871–). An American lawyer, son of William Mecklenburg Polk and grandson of Leonidas Polk. He was born in New York City, graduated from Yale in 1894 and from Columbia Law School in 1897, and served as captain during the Spanish-American War. He then practiced law in New York and was a member of the Board of Education and of the Municipal Civil Service Commission under Mayor McClellan. In 1914 he was appointed corporation counsel by Mayor Mitchel and in the following year became counselor to the State Department at Washington, after Mr. Robert Lansing had been promoted from the counselorship to the post of Secretary of State.

POLK, JAMES KNOX (1795–1849). The eleventh President of the United States, born in Mecklenburg Co., N. C., Nov. 2, 1795. His ancestors, who bore the name of Pollock, emigrated from the north of Ireland early in the eighteenth century. Polk graduated at the University of North Carolina in 1818, then studied law with Felix Grundy (q.v.) at Nashville, Tenn., and was admitted to the bar in 1820. Three years later he was elected a member of the State House of Representatives and soon afterward (1825) was sent to Congress by the Democratic party, serving as Speaker in the Twenty-fourth and Twenty-fifth Congresses. In Congress he won distinction by his industrious habits and readiness in debate. He was one of the chief supporters of President Jackson's administration and gave the same loyal support to Jackson's successor, Martin Van Buren. As Speaker it devolved upon him to preside over the deliberations of the Representatives at a time when party feelings were bitter, and his rulings were frequently appealed from, although usually sustained by the House. After 14 years in Congress he was elected Governor of Tennessee in 1839 and was nominated for the office again in 1841 and 1843, but was each time defeated by the Whig candidate. Nevertheless, his standing among his party associates was not impaired, and when the vigorous opposition to Van Buren made impossible the latter's nomination for the presidency in 1844, especially under the rule which required a majority of two-thirds of all the delegates to the national convention to nominate, Polk was introduced as a compromise candidate and was unanimously nominated on the ninth ballot. The Whig candidate, Henry Clay, had compromised himself in some parts of the country by his attitude in regard to the annexation of Texas, whereas the Democratic platform was moderately acceptable to both North and South through its advocacy of the "reoccupation of Oregon and the reannexation of Texas." Polk received 170 electoral votes, as against 105 for Clay. George M. Dallas was elected Vice President. During his term the Oregon boundary dispute was settled with England, the United States accepting the parallel of 49° as the northern limit, though the party cry that helped to elect Polk was a claim for the entire territory to lat. 54° 40′ N. A dispute regarding the boundary of Texas led, in 1846, to a war with Mexico, which resulted in the acquisition, through the Treaty of Guadalupe Hidalgo (q.v.), of California and New Mexico. The chief event of President Polk's administration relating to internal affairs was the enactment of the tariff law of 1846, which was based on the principles of tariff for revenue only, and the establishment of the independent treasury system. The President set himself against the internal-improvement mania by vetoing a river and harbor bill which appropriated a large sum for improvement purposes. Regarding the slavery question, the debate over the Wilmot Proviso (q.v.) and over the bill to organize the Territory of Oregon were the most notable events. In private life President Polk was unostentatious, frank, and courteous. His habits were extremely simple, and his character exemplary. He died at Nashville, Tenn., June 15, 1849. Consult: J. S. Jenkins, *Life of James K. Polk* (Auburn, N. Y., 1850); G. P. Garrison, *Westward Extension* (New York, 1906); *Diary of James K. Polk*, edited by M. M. Quaife (4 vols., Chicago, 1910); G. L. Rives, *The United States and Mexico* (2 vols., ib., 1913); George Bancroft, "James K. Polk," in J. G. Wilson, *Presidents of the United States* (ib., 1914). See UNITED STATES.

POLK, LEONIDAS (1806–64). An American soldier and first Protestant Episcopal Bishop of Louisiana. He was born at Raleigh, N. C., educated at the University of North Carolina and at West Point Military Academy. While at West Point he came under the influence of Dr. McIlvaine, afterward Bishop of Ohio, and was converted. After graduation he resigned from military service and prepared for the ministry at the theological seminary at Alexandria, Va., being ordained at Richmond in 1830. After a year of Church work he traveled in Europe to benefit his health. Upon his return to the United States he removed to Tennessee, and in 1838 the General Convention appointed him Missionary Bishop of the Southwest—a field embracing Arkansas, Indian Territory, Mississippi, Louisiana, and Alabama. He retained this post until elected Bishop of Louisiana in 1841. He formulated a scheme for higher education in the South which finally resulted in the establishment of Sewanee University, a charter for which was granted by the State of Tennessee in 1858. At the outbreak of the Civil War his sympathies were wholly with the Southern cause. His travels in pursuance of episcopal duties made him thoroughly familiar with the Lower Mississippi States, and he urged upon the President of the Confederacy the necessity of their defense. In response he was urged to take a commission, and with the approval of his clerical friends he became a major general in June, 1861, and accepted the command of Department No. 2, which involved the duty of defense of both sides of the Mississippi from the mouth of the Red River to Cairo, with headquarters at Memphis. He commanded the Southern forces in the battle of Belmont, participated in the engagements of Shiloh and in the operations that led up to the evacuation of Corinth, took part in Bragg's invasion of Kentucky as commander of the Army of the Mississippi, and fought in the battle of Perryville. In October, 1862, he was made lieutenant general and fought at Murfreesboro and Chickamauga. In the last-named engagement it was charged by General Bragg that Polk's delay in making attack lost the victory. As a consequence he was temporarily suspended from his command; but the charges were dismissed by President Davis, who offered to reinstate the deposed general. Declining this offer, Polk assumed the charge of paroled prisoners at Enterprise, Miss., and when Gen. Joseph E. Johnston was assigned to the command of the Army of the Tennessee, followed that general in charge of the Department of Alabama, Mississippi, and East Louisiana. He was killed by a cannon shot while reconnoitring the field of Marietta near Pine Mountain. Consult W. M. Polk, *Leonidas Polk, Bishop and General* (New York, 1893; new ed., 2 vols., ib., 1915).

POLK, William Mecklenburg (1844–). An American physician, son of Leonidas Polk, born at Ashwood, Maury Co., Tenn., and served in the Confederate army during the Civil War, advancing from the rank of cadet to captain. After graduating from the College of Physicians and Surgeons, New York, in 1869, he settled in the same city, serving as professor of therapeutics and clinical medicine at Bellevue Hospital Medical College (1875–79), of obstetrics and gynæcology at the University of the City of New York (1879–98), and subsequently as dean and professor of gynæcology at Cornell University Medical College. He also became connected with many hospitals and dispensaries, was president of the New York Academy of Medicine in 1910–14, and is author of *Leonidas Polk, Bishop and General* (1893; new ed., 2 vols., 1915) and of numerous contributions to medical journals, later reprinted.

POLKA, pōl′kȧ (from Boh. *pulka*, half; so called from the half step characteristic of the dance). A round dance supposed to have originated in Bohemia about 1830. The music is in $\frac{2}{4}$ time and has the rhythmical peculiarity of being accented on the third quaver of the measure:  It was introduced as a fashionable dance into western Europe about 1841 and soon became extremely popular; in France in particular it created a furore. Its movement is lively, though not so rapid as that of the galop.

POLLACK, pŏl′ak (from Gael. *pollag*, whiting, Ir. *pullog*, pollack), or Pollock. A codfish (*Pollachius virens*), common on both coasts of the North Atlantic and more commonly known in the United States as coalfish. It is dark greenish brown above, sides and below being somewhat silvery. It attains a weight of about 30 pounds and is of value as a food fish. Its habits differ from those of the cod or haddock, for it is to a great extent a surface-swimming fish and congregates in large schools, which swim about in search of young fishes as food; but they also feed at the bottom like cod. They seem to spawn while swimming about, and their eggs float and hatch in five or six days. Their flesh is highly esteemed, especially about the Gulf of Newfoundland, and their liver yields an excellent oil in large quantities.

The Alaskan pollack (*Nieragra chalcogramma*) is a very similar fish, abundant in the North Pacific, and especially in Bering Sea, where it furnishes the larger part of the food of the fur seal and is of great value to the natives of both coasts. It is uniformly dark olive and reaches a length of 3 feet. Another more sooty species, the wall-eyed pollack (*Nieragra fucensis*), is numerous in Puget Sound and on the California coast.

Consult G. B. Goode, in *Fishery Industries*, sec. 1 (Washington, 1884). See Plate of Codfish.

POLLAIUOLO, pōl′lī-wô′lō, Antonio (1429–98) and Piero (1443–96). Florentine artists of the early Renaissance. Antonio stood at the head of the most popular bottega (workshop) in Florence, in which labored many assistants and pupils. Its product consisted of goldsmith's work, sculptures (especially bronzes), paintings, niello (q.v.), enamels, and all manner of decorative work. In engraving he was associated with the well-known Finiguerra (q.v.). He was patronized by the Medici and the Signory of Florence and wrought especially for the cathedral, in the museum of which his imposing silver relief, "The Beheading of St. John Baptist," and sumptuous embroideries after his designs still survive. In 1484, following the summons of Pope Innocent VIII, he removed with Piero to Rome. There he modeled his two most important surviving works, the fine bronze tombs of Pope Sixtus IV (1493) and Innocent VIII (1498) in St. Peter's, and died in 1498, two years after his brother. Antonio was, after Verrocchio, the chief bronze sculptor of the later fifteenth century. His work is executed with a goldsmith's fineness and love for detail; it lacks breadth and inspiration, but it is unsurpassed in the rendition of movement, both in sculpture and in painting—for in this regard Antonio made greater progress than any other artist of the century. He was also the first to study anatomy systematically, in the modern sense. He appears to greatest advantage in studies taken direct from nature, probably intended as models for his pupils—like the small bronze "Hercules Strangling Antæus," the very quintessence of movement, his pictures of the same subject and of "Hercules Slaying the Hydra," and his engraving of "Ten Fighting Nudes," all in the Uffizi Gallery. The same collection possesses a bust of a "Young Warrior," probably by him.

In his paintings he was often assisted by his brother Piero, who, generally speaking, worked after Antonio's designs. A pupil of Baldovinetti, Piero lacked force and originality, being entirely under Antonio's influence. The best of Antonio's paintings are the frescoes of dancing figures in the Torre del Gallo, Florence; "David," in the Berlin Museum, and "Apollo and Daphne," in the National Gallery, London. Of the "Five Virtues" in the Uffizi, two are entirely by Piero. The recently uncovered frescoes at Staggia, near Siena, and the well-known "Tobias and the Angel," at Turin, are probably joint work. Among portraits assigned to one or the other are "Galeazzo Sforza," in the Uffizi, and "The Profile of a Lady," in the Gardner collection, Boston. Berenson attributes to Antonio "Hercules and Nessus," in the Jarves collection, Yale University, and a large fresco of "St. Christopher Bearing the Infant Christ," in the Metropolitan Museum, New York; but the latter is probably a "school" picture. The only signed picture by Piero is his "Coronation of the Virgin," in the collegiate church of San Gemigniano. Consult: Giorgio Vasari, *Lives of the Most Eminent Painters, Sculptors, and Architects*, vol. ii (Eng. trans. by Blashfield and Hopkins, New York, 1896); Maud Crutwell, *Antonio Pollaiuolo* (London, 1907); Kenyon Cox, in *Painters and Sculptors* (New York, 1907); Bernhard Berenson, *Florentine Painters of the Renaissance* (ib., 1909).

POLLAIUOLO, Simone del (1457–1508). An Italian architect. He was born in Florence and spent a number of years in Rome devoted to the study of the monuments of antiquity. He was a keen observer, and from his habit, after his return to Florence, of describing with great minuteness the sights of the Eternal City, the nickname Il Cronaca (the chronicler) was bestowed upon him by his fellow artists. In 1495 he was appointed chief architect of the Duomo. After the death of Benedetto da Majano he became the architect of the Palazzo Strozzi, to the façade of which he added the splendid cornice, his inimitable masterpiece. He built also the Palazzo Guadagni (now Palazzo Dufour-Berte), a handsome structure in the early Renaissance style, and the church of San Francesco or San Salvatore al Monte, an edifice imposing in its very simplicity and chaste proportions, which was greatly admired and praised by Michelangelo. Among the few other works that may be ascribed to him with certainty are portions of the sacristy of San Spirito, the court of the Palazzo Strozzi, and the great hall in the Palazzo Vecchio. Consult Anderson, *The Architecture of the Renaissance in Italy* (London, 1896), and Geymüller-Stegmann, *Die Architektur der Renaissance in Toscana* (Florence, 1885–96).

POL′LANARRU′A. A ruined city of Ceylon, in the Province of Tamankadme, about 60 miles northeast of Kandy; now called Toparé. It was the capital of the island in 769–1235. Its golden age was in the reign of Prakrama Bahoo I (1153–86), who fortified it, built a royal palace, a monastery and residence for the priesthood, the superb Rankot Dagoba, and many other public buildings. When the Malabars took it, about 1204, they demolished it and reduced it to its present condition. The most remarkable building is the Jaitawanarama Temple. Opposite the entrance is an image of Gautama Buddha 50 feet high. The Sat Mahal Prasada is a handsome pyramidal building. The palace of Prakrama Bahoo I is on the borders of the Toopawewa, an artificial lake.

POL′LARD, Albert Frederick (1869–). An English historian, born at Ryde, Isle of Wight. Educated at Jesus College, Oxford, he became fellow of All Souls. From 1893 to 1901 he was assistant editor of the *Dictionary of National Biography.* He was professor of English history in the University of London and in 1913 was the first Goldwin Smith lecturer at Cornell University. His special field was Tudor England. Pollard wrote (besides many articles for the *Dictionary of National Biography*, the *Cambridge Modern History*, the *Encyclopædia Britannica*, and vol. vi, 1547–1603, of Hunt and Poole's *Political History of England*): *The Jesuits in Poland* (1892); *Thomas Cranmer and the English Reformation* (1898); *England under Protector Somerset* (1900); *Henry VIII* (1902; rev. ed., 1905, 1913); *Factors in Modern History* (1907); a short *History of England* (1912); *The Reign of Henry VII, from Contemporary Sources* (3 vols., 1913–14); *The War: Its History and its Morals* (1915).

POLLARD, Charles Louis (1872–). An American botanist, born in New York City. He was educated at Columbia (A.B., 1893; A.M., 1894), served as an assistant curator in the United States Department of Agriculture (1894–95) and in the United States National Museum (1895–1903), and in 1907 became curator in chief of the Public Museum of Staten Island, N. Y. After 1897 Pollard served also as editor of the *Plant World.* He contributed to *Webster's International Dictionary* in 1900 and to the *Century Dictionary* in 1903 and was editor for botany and horticulture of *Webster's New International Dictionary.*

POLLARD, Edward Albert (1828–72). An American journalist, born in Nelson Co., Va. He graduated at the University of Virginia in 1849, studied law, went to California and engaged in journalism until 1855, and then traveled extensively in Europe and in the Orient. At the beginning of the Civil War he was preparing for the Episcopal ministry. From 1861 until its suppression by the military authorities in 1865 he was an editor of the Richmond *Examiner*, but, nevertheless, a merciless critic of President Davis. Near the close of the war, while attempting to run the blockade on his way to England, he was captured and imprisoned for eight months in Fort Warren and Fortress Monroe. His books include: *Black Diamonds Gathered in Darky Homes of the South* (1859), an attempt to show the bright side of slavery; *Letters of a Southern Spy in Washington and Elsewhere* (1861); *Southern History of the War* (1862–66); *The Lost Cause* (1866), a shorter history of the war; *Lee and his Lieutenants* (1867); *Life of Jefferson Davis, with Secret History of the Southern Confederacy* (1869). His books show considerable literary ability, but his violent prejudices prevented any sort of fairness to the objects of his dislike.

POL′LARDING (from *pollard*, from *poll*, head). The process very commonly practiced in

Europe of cutting off the crown of a tree to make it throw out numerous water sprouts from the top of the remaining trunk. Trees so treated, called pollards, are not beautiful, but are useful in districts where fuel is scarce, since the branches are cut every third or fourth year. The practice is not common in the United States. Trees of rapid growth, such as willows, poplars, alders, elms, and limes, are most frequently pollarded. While the operation apparently injures the tree, it should be noted that many of the oldest trees in Europe, and the largest in diameter, have been continuously pollarded. See Plate of WILLOWS.

POLLED DURHAM. See CATTLE.

POL'LEN (Lat., fine flour, fine dust). A name applied to the microspores of seed plants and popularly regarded as the "fertilizing dust" produced by flowers. See SPORE.

POLLEN, JOHN HUNGERFORD (1820–1902). An English artist and writer, born in London. He graduated M.A. at Christ Church, Oxford, in 1844 and was fellow of Merton College in 1842–52. In 1855–57 he served as professor of fine arts at the Catholic University of Ireland, Dublin. Pollen was among the first to reintroduce fresco decoration into England and after 1860 had many commissions for that kind of work. In 1863–76 he was connected with the art and industrial department of South Kensington (now Victoria and Albert) Museum. His publications include: *Universal Catalogue of Books on Art* (3 vols., 1870–77); *Ancient and Modern Furniture and Woodwork* (1873; 3d ed., rev. by T. A. Lehfeldt, 1908); *Ancient and Modern Gold and Silversmith's Work* (1876).

POLLEN'TIA. An ancient place in north Italy, on the Tanarus, represented by the modern little town of Pollenzo, 33 miles south of Turin, near Bra. The ruins of an aqueduct, an amphitheatre, a theatre, and a temple mark the site of the ancient city, where Alaric and Stilicho fought in 402 or 403 A.D.

POLLENZO, pŏl-lĕn'tsō. See POLLENTIA.

POLL-EVIL. A painful swelling on the head or the neck of horses, which if not attended to may become a troublesome and serious ulcer. It may be caused by striking the head against a beam, straining against the halter, or by the use of an excessively tight rein when driving. If the swelling continues to increase and pus forms it must be lanced. Drainage must be promoted—a seton sometimes being used for this purpose—to prevent bone involvement. This is all the treatment required, except fomentations of tepid water to insure cleanliness, if the disease be taken in its early stages.

POLLICEM PREMERE. See POLLICE VERSO.

POLLICE VERSO, pŏl'lĭ-sē vĕr'sō (Lat., with thumb turned). The sign by which the spectators at the Roman gladiatorial combats expressed their wish that the vanquished gladiator should be put to death. (Consult Juvenal, iii, 36.) The exact nature of this sign is unknown; for a careful discussion of various views concerning it, consult E. Post, "Pollice Verso," in the *American Journal of Philology*, xiii, 214–225 (Baltimore, 1893). Post himself, holding that the thumb symbolized the short Roman sword, suggested that the gesture which meant the death of the vanquished gladiator was given by turning the hand over, into an unnatural position, with the thumb (sword) pointing at the defeated man. The gesture which called for the release of the defeated man (expressed in Latin by the phrase *pollicem premere*) Post thought to consist in hiding the thumb entirely (i.e., sheathing the sword). The famous painting, "Pollice Verso," by Gérôme, shows the victor standing over his prostrate rival and looking up to the benches for the verdict of the spectators, who are represented with thumbs turned down.

POL'LINA'TION. Transference of the pollen (q.v.) from the stamen of a flower to the stigma of the same flower (self or close pollination) or to that of another flower (cross-pollination). Several terms associated with these processes may be here defined: *autogamy*, self-pollination of flowers; *allogamy*, cross-pollination; *geitonogamy*, cross-pollination between two flowers upon one plant; *xenogamy*, between flowers of different plants. Flowers containing both stamens and pistils are called *monoclinous*, or *hermaphroditie;* if stamens are in one flower and pistils in another, but both kinds are on the same plant, the plants are said to be *diclinous* and *monœcious* (Fig. 1); if on different plants, *diœcious* (Fig. 2). *Anthesis* is the period during which pollination is possible; flowers that remain closed during this period exhibit *cleistogamy* (q.v.), those that open all or part of the time exhibit *chasmogamy*. Flowers the stamens or pistils or both of which are of unequal lengths are said to show *heteromorphism;* if two lengths occur, *dimorphism* (Fig. 3); if three are present, *trimorphism*. In *homogamous* flowers the stigmas mature when the pollen grains are shed; in *dichogamous*, these two periods differ. If the stigmas mature first, the flower exhibits *protogyny* or

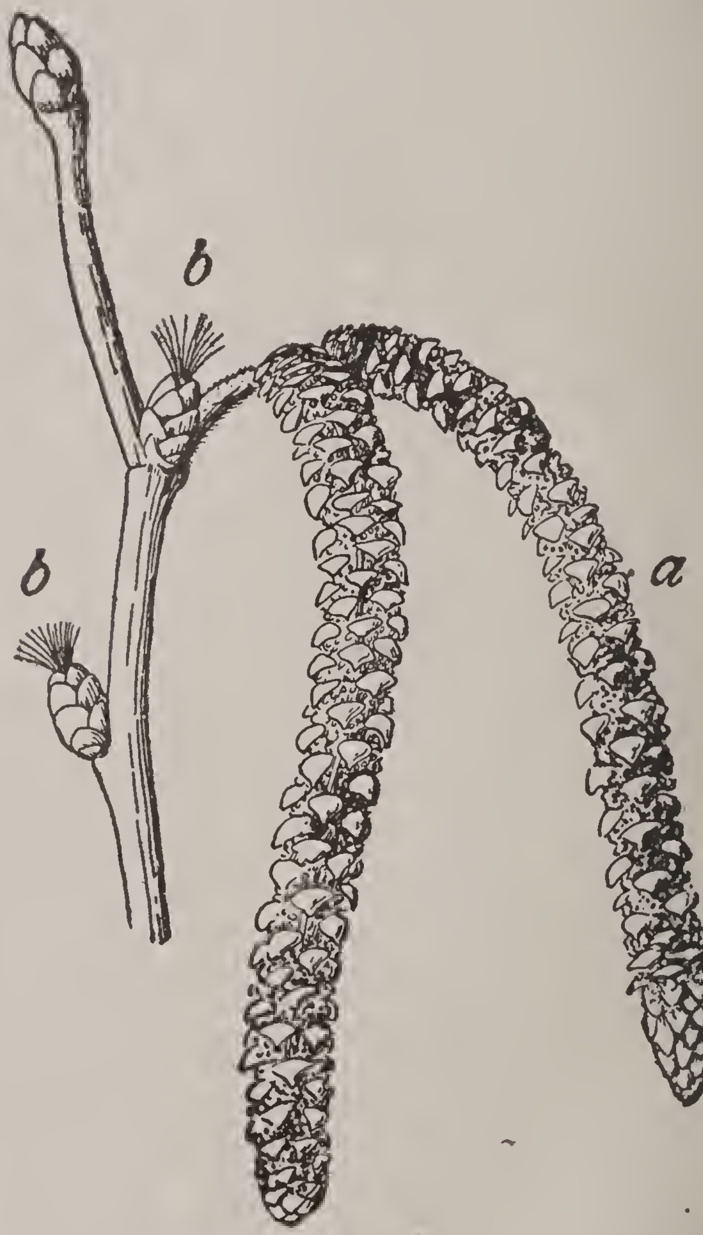


FIG. 1. MONŒCISM.

The hazel (*Corylus*), showing pistillate flower clusters (*b*) and staminate catkins (*a*) on the same twig. Self-pollination is possible here, as is never the case in a diœcious plant like the willow (Fig. 2).

proterogyny; if the pollen grains are shed first, *protandry* or *proterandry* (Fig. 4).

In general, cross-pollination seems to be somewhat advantageous to plants because it is supposed to prevent close inbreeding, which in both plants and animals appears to result in degeneracy. The reason for this is not known.

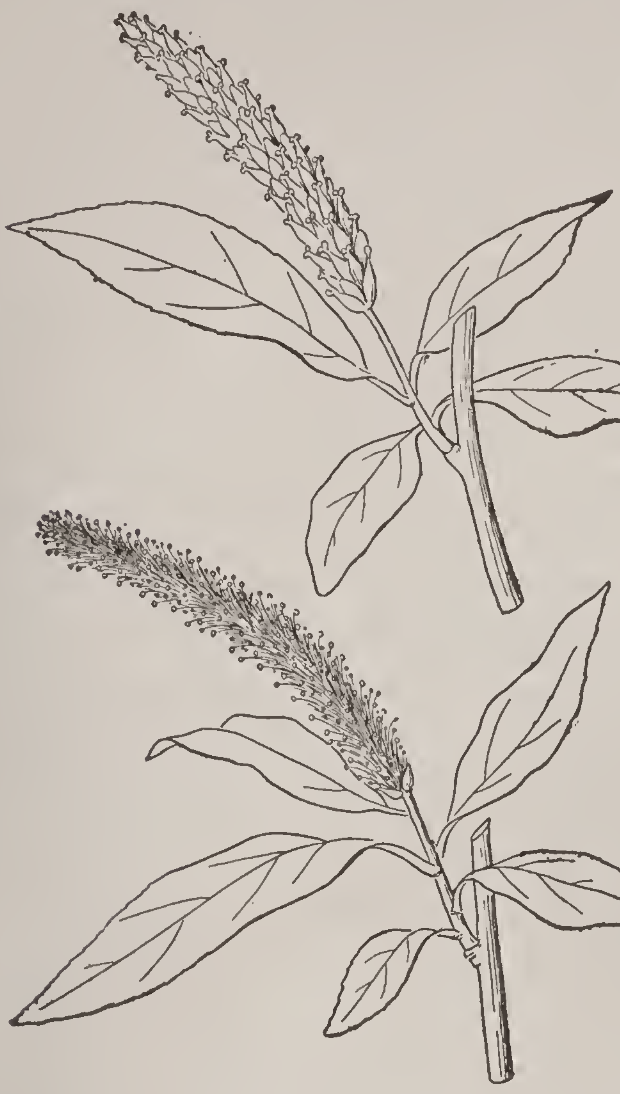


Fig. 2. diœcism.

Catkins of the crack willow (*Salix fragilis*), the lower staminate, the upper pistillate. These catkins are borne on separate plants, thus insuring cross-pollination.

There are various devices by which cross-pollination is obtained. The most perfect device is the so-called diœcious habit illustrated by the willows (Fig. 2). In the so-called monœcious habit (Fig. 1) cross-pollination is less certain, though it is often facilitated by the pistillate flowers being uppermost on the tree. In the case of insect-pollinated flowers cross-pollination is sometimes secured by protandry (Fig. 4) or protogyny. In many cases the stigma when mature is higher than the stamens, and hence self-pollination is difficult. Perhaps the most effective device to insure cross-pollination is the impotence of the pollen upon the stigma of the same flower and even of other flowers on the same plant. It must be remembered that in some plants self-pollination is not only possible but even common. It is invariably the case in cleistogamous flowers. (See Cleistogamy.) In the subterranean flower of the violet self-pollination is necessary, and the rich development of seeds shows that it is effective.

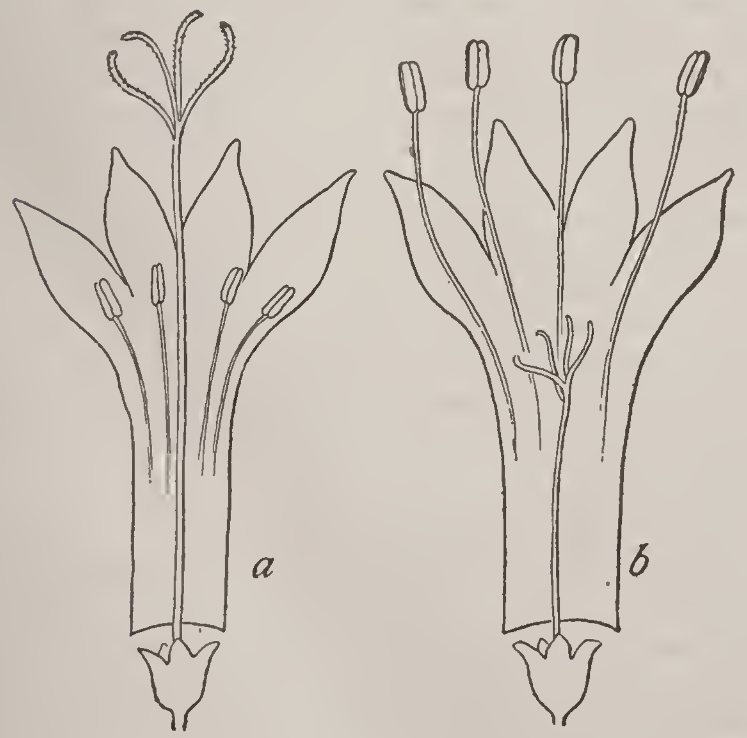


Fig. 3. dimorphism.

Flowers of the *Houstonia*, illustrating a means for facilitating cross-pollination. In *a* the styles are long and the stamen filaments short; while in *b* the reverse is true. Pollen obtained from anthers on long stamens is likely to be brushed off upon the stigmas of the long styles; while pollen from the short stamens will be brushed off upon the stigmatic surface of the short styles.

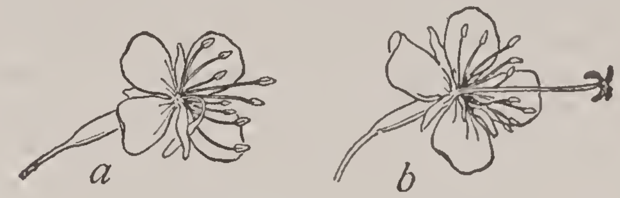


Fig. 4. protandry.

Flowers of a fireweed, showing a young condition (*a*), in which the stamens, but not the stigmas, are mature, and an older condition (*b*), in which the pollen has gone, while the stigmas are mature. Cross-pollination is thus effected.

Pollination is effected in various ways in plants, among which the most important are the following: 1. Insect pollination. In a vast number, perhaps even the majority of plants, pollen is transferred by insects. The structure of the insect-pollinated flowers is commonly more or less complicated and differs somewhat widely from that of flowers pollinated in other ways (Fig. 5). For example, the corollas are commonly prominent and highly colored, and it is

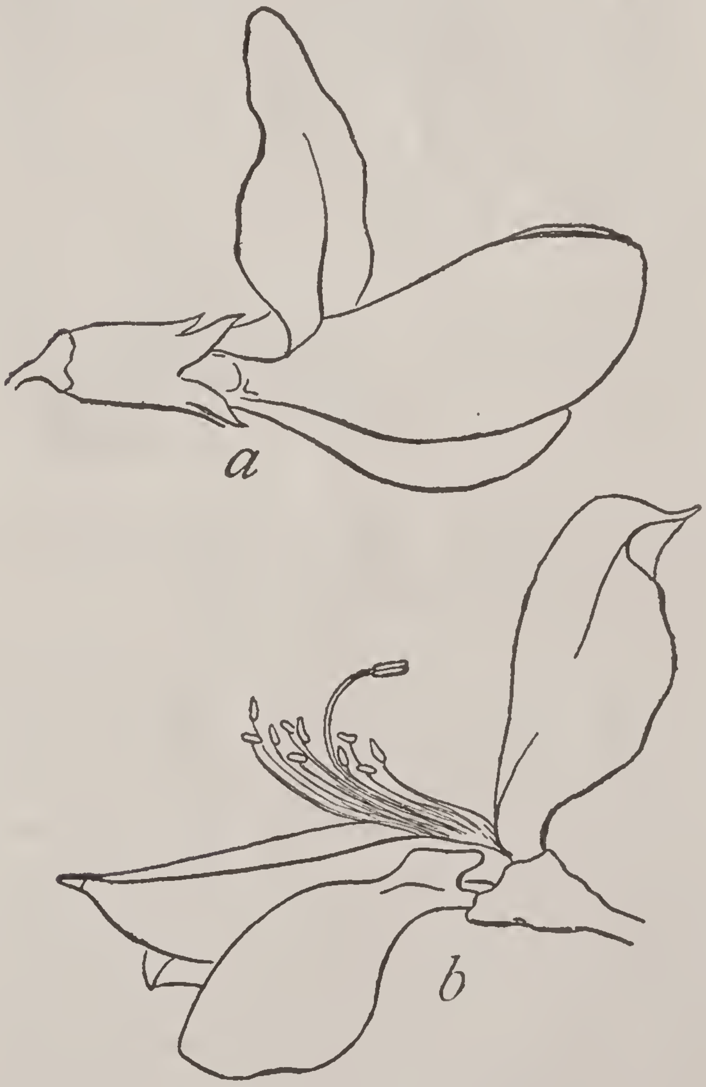


Fig. 5. insect pollination.

The flower of a legume, showing the normal condition (*a*) and the condition which appears when an insect alights on the flower (*b*). It is obvious that insect pollination can be readily effected here.

believed that insects are more likely to visit flowers if their corollas are colored. Some experiments, however, appear to show that color may not serve conspicuously as an attraction. Many flowers are attractive to insects because of their fragrance, which is a device to secure cross-pollination. The pollen of insect-pollinated flowers is often comparatively sticky and heavy. A large number of structures are found in these flowers which appear to favor certain insects and oppose others. Among the more striking of these devices is a long corolla tube which favors insects with a long proboscis. In general, insect-pollinated flowers are rich in nectar, which is often the lure for the visit of insects. Other flowers are visited for their pollen, of which many insects are fond. 2. Bird pollination. A comparatively small and in North America unimportant number of flowers are pollinated by birds, especially humming birds. 3. Wind pollination is common with a large number of plants, especially trees, grasses, and sedges, in which the flowers differ from insect-pollinated flowers in the relative absence of showiness, nectar, odor, etc. These flowers are also comparatively small. The pollen is usually light, easily carried by the wind, and is also produced in very large quantities. Pine pollen is particularly interesting in that it is winged (Fig. 6, *a*). It is so abundant that it sometimes forms the so-called sulphur showers. 4. Water-pollinated flowers. A small number of aquatic plants are pollinated by means of water currents. In some cases, as in *Vallisneria*, a somewhat complex mechanism is present.

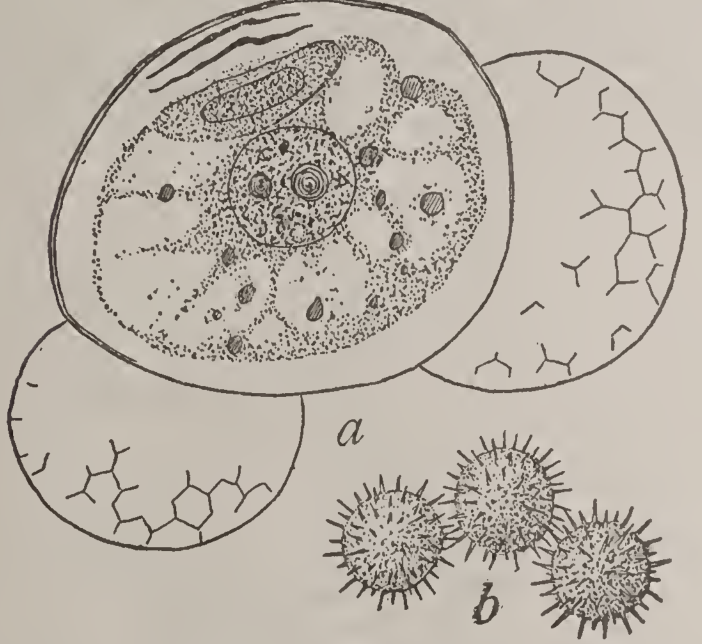


FIG. 6. POLLEN GRAINS.

a, from the pine, showing bladder-like wings which facilitate dispersal, and *b*, from the hibiscus showing spines which facilitate attachment to the stigma.

POL′LIO, GAIUS ASINIUS (70 B.C.–4 A.D.). A Roman orator, politician, soldier, and author of considerable merit. He was born in Rome, but belonged to a family of Marrusinian descent. When civil war broke out between Cæsar and Pompeius, Pollio sided with the former, was present at the crossing of the Rubicon, and took part in the battle of Pharsalus (48 B.C.). At the time of Cæsar's assassination Pollio was Governor of Further Spain and was carrying on the war against Sextus Pompeius. In the subsequent struggles he sided with the triumvirate against the oligarchic senate and, on the triumph of the former, was appointed administrator of Gallia Transpadana, in which capacity he helped to save the property of the poet Vergil, near Mantua, from confiscation. After Antonius and Octavianus had quarreled, Pollio effected their temporary reconciliation at Brundusium (40 B.C.); in the next year he conducted a successful campaign against the Parthini, a people of Illyria, and in consequence obtained a triumph. After this event, however, he withdrew from political life. Besides having a reputation for oratory, Pollio was celebrated as a historian, poet, and critic. (Consult Horace, *Odes*, ii, 1.) His literary and political criticism of his contemporaries, in particular, appears to have been valuable. He deserves remembrance also as a distinguished patron of Catullus, Horace, Vergil, and other men of letters and as the founder of the first public library at Rome. Of the writings of Pollio we possess only three letters to Cicero (published among Cicero's correspondence *Ad Familiares*, v, 31–33), and a few fragments of his *History of the Civil Wars*, collected by Peter, *Historicorum Romanorum Fragmenta* (Leipzig, 1883). Wölfflin would attribute to Pollio the *Bellum Africanum* (published with Cæsar's works by Dinter, Leipzig, 1890), but this theory is not generally accepted. Consult: Landgraf, *Untersuchungen zu Cäsar und seinen Fortsetzern* (Erlangen, 1888); Wölfflin and Miadoriski, *Pollionis de Bello Africo Commentarius* (Leipzig, 1889); Schmalz, *Ueber den Sprachgebrauch des Asinius Pollio* (Munich, 1890); Kornemann, *Die historische Schriftstellerei des Asinius Pollio* (Leipzig, 1896); V. Gardthausen, *Augustus und seine Zeit*, vol. i (1896–1904); Martin Schanz, *Geschichte der römischen Litteratur*, vol. ii, part i (3d ed., Munich, 1911). In "A Witticism of Asinius Pollio," in the *American Journal of Philology*, xxxvi (Baltimore, 1915), G. L. Hendrickson discusses anew Pollio's charge that the writings of the historian Livy (q.v.) were marked by *patavinitas*.

POLLIO, VITRUVIUS. See VITRUVIUS POLLIO.

PÖLLNITZ, pĕl′nĭts, KARL LUDWIG, BARON VON (1692–1775). A German memoirist. He was remarkable for his talents, but his extravagant and vagabond habits often reduced him to the greatest poverty. After wandering all over Europe, taking service in the Church in Austria and in the army in Spain, he finally attracted the favorable notice of Frederick the Great, who appointed him his reader and made him director of the theatre at Berlin. After changing twice from Catholicism to Calvinism, shortly before his death he proclaimed himself a member of the Church of Rome. Among his works, marked by keen observation and wit, are *Lettres et mémoires* (1734) and *Etat abrégé de la cour de Saxe, etc.* (1734). He was probably also the author of *Histoire secrète de la duchesse d'Hanovre, etc.* (1732) and *La Saxe galante* (1734).

POL′LOCK. See POLLACK.

POLLOCK, SIR FREDERICK (1845–). An English jurist and author, nephew of Field Marshal Sir George Pollock, brother of Walter Herries Pollock, and father of John Pollock. He was born in London, Dec. 10, 1845, and was educated at Eton and at Trinity College, Cambridge, of which he was made fellow in 1868. Called to the bar at Lincoln's Inn (1871), he served as examiner in law at Cambridge (1879–81); as professor of jurisprudence at University College, London (1882–83), Corpus professor of jurisprudence at Oxford (1883–1903), and professor of common law in the Inns of Court (1884–90); as a member of the Royal Labor Commission (1891–94) and as chairman of the Royal Commission on Public Records (1910). In 1914 he was appointed Judge of the Admiralty Court of the Cinque Ports. Pollock became a fellow of the British Academy in 1902, honorary fellow of Corpus Christi, Oxford, in 1906, and Privy Councilor in 1911. In 1888 he succeeded his father as third Baronet of the name. From 1895 he edited the British Law Reports. His works pertaining to the legal profession comprise mainly: *Principles of Contract* (1876; 8th ed., 1911); *Digest of the Law of Partnership* (1877; 10th ed., 1915); *The Land Laws* (1882; 3d ed., 1895); *The Law of Torts* (1887; 9th ed., 1912); *Law of Fraud* (1894); *History of English Law* (1895; 2d ed., 1898), with Frederick William Maitland (q.v.); *A First Book of Jurisprudence* (1896; 3d ed., 1911); *The Expansion of the Common Law* (1904); *The Genius of the Common Law* (1912), lectures at Columbia University. In the same field are his valuable introduction and notes to Maine's *Ancient Law* (1906; 2d ed., 1908). Better known to the general reader is *Spinoza: His Life and Philosophy* (1880; enlarged ed., 1912). Further versatility is shown by his *Introduction to the History of the Science of Politics* (1890; rev. ed., 1911) and by many brilliant political articles contributed to the *Pall Mall Gazette* and the *Saturday Review.* Pollock also wrote verse parodies of typical law cases: *Leading Cases Done into English* (1877), popular from the first, and reissued, enlarged (*with Other Diversions*), in 1892; and in 1899, with Ella Fuller Maitland, he published *The Etchingham Letters,* a clever novel in epistolary form. Consult his *Personal Reminiscences* (London, 1887).

POLLOCK, Sir George (1786–1872). A British soldier. He studied at the Royal Military Academy at Woolwich until 1803 and then entered the East India Company's service as a lieutenant of artillery. He arrived in India towards the end of the Mahratta wars, at once went to the front, and participated in the sieges of Deeg (Nov. 12–Dec. 25, 1804) and Bhurtpore (Jan. 4–April 2, 1805). During the First Burmese War he took an important part in the military operations and at its close was invalided home. In 1838 he was promoted major general and in 1842 was assigned to command the British forces in the war against the Afghans. He forced the Khyber Pass and captured Kabul. For these services he received a pension of £1000 from the East India Company and many honors from the Indian and British governments. In 1870 he was commissioned field marshal in the British army, a year later was made constable of the Tower of London, and in 1872 was created Baronet. He was the uncle of Sir Frederick and Walter Herries Pollock. Consult C. R. Low, *Life of Field-Marshal Sir George Pollock* (London, 1873), and Sir J. W. Kaye, *History of the War in Afghanistan in 1838 to 1842.*

POLLOCK, John (1878–). An English playwright and historical writer, son of Sir Frederick Pollock. He was educated first at Eton, graduated M.A. at Trinity College, Cambridge, in 1903, studied at the University of Vienna in 1901 and at Harvard Law School in 1903–04. In 1906 he was called to the bar, but soon turned his attention to writing for the stage. Among his plays are: *The Invention of Dr. Metzler* (1905); *Rosamond* (1910); *The Love of Mrs. Pleasance* (1911); *Madame Diana* (1913); *Anna Karénina* (1913), from Tolstoy's novel. Pollock also translated Ibsen's *A Doll's House* and *Hedda Gabler* (1911); Tolstoy's *The Man who was Dead* (1912); Brieux's *Damaged Goods* (1914). In another field he published *The Popish Plot* (1903) and contributed to the *Cambridge Modern History.*

POLLOCK, Walter Herries (1850–). An English author, nephew of Sir George Pollock and brother of Sir Frederick Pollock, third Baronet. He was born in London and was educated at Eton and at Trinity College, Cambridge, where he graduated with classical honors in 1871. Though called to the bar at Lincoln's Inn (1874), he early began to give most of his time to journalism and literature. From 1883 to 1894 he was editor of the *Saturday Review.* His work includes, among other writing, much graceful and humorous verse: *Lectures on French Poets* (1879); *The Poet and the Muse* (1880), a metrical translation from Alfred de Musset's *Nuits; Songs and Rhymes, English and French* (1882); *The Picture's Secret* (1883), a novel; *The Paradox of Acting* (1883), translated from Diderot; *Verse of Two Tongues* (1884); *Old and New* (1890), verse; *A Nine Men's Morrice* (1889) and *King Zub* (1892), two volumes of fantastic tales; *Mémoires inédits du Marquis de ———* (French, 1894); *The Charm, and Other Drawing-Room Plays* (1896), with Sir Walter Besant; *Jane Austen: Her Contemporaries and Herself* (1899); *Impressions of Henry Irving* (1908); *The Art of the Hon. John Collier* (1914).

POL'LOK, Robert (1798–1827). A Scottish poet, son of a poor farmer. He was born at North Moorhouse, Renfrewshire; was educated at the University of Glasgow (M.A., 1822) and for the ministry at the United Secession Hall (1822–27), was licensed to preach (1827), and died of tuberculosis after setting out to visit Italy for his health. Pollok's *The Course of Time* (1827), a long essay in blank verse treating of the destiny of man, was popular on both sides of the Atlantic. He had written earlier *Tales of the Covenanters.* Consult the *Life* by his brother, David Pollok (Edinburgh, 1843).

POL'LOKSHAWS. A municipal borough and manufacturing town in Renfrewshire, Scotland, on the White Cart, 3 miles southwest of Glasgow of which it is virtually a suburban extension, connected by electric street railroads, etc. Many working people employed in Glasgow live here. Cotton spinning, calico printing, silk weaving, bleaching, iron founding, and fancy dyeing are extensively carried on. Pop., 1901, 11,183; 1911, 12,932.

POLL TAX. See Capitation; Tax.

POLLU'TION OF WATERCOURSES (Lat. *pollutio,* from *polluere,* to defile, from *por-,* forth + *luere,* to wash). By the common law owners of real property adjoining running streams are entitled to make such a use of their waters as will not inflict material damage or an unreasonable degree of discomfort upon owners above and below them on the stream. In some of the United States the common-law rule has been modified so as to permit riparian proprietors to make any use of the stream which, under all the circumstances and taking into account the needs of all other riparian proprietors affected by such use, will be deemed a reasonable one. This modified doctrine has generally come to prevail with respect to mill streams in the New England States. As this doctrine of "reasonable user" is applied, no absolute and definite rule can be framed as to what extent the waters of a stream can be polluted or contaminated by an adjoining owner. As streams are natural means of drainage of land, it has been held that a city cannot be restrained from causing its sewage to flow into a stream, unless an unusual or unreasonable quantity is discharged therein. Mills and other industries along a stream naturally impair the quality of the water somewhat, but as a general rule the courts will "not interfere if they are adapted to the stream and do not cause it to give off odors which are injurious to health." The discharge of dye materials, poisonous chemicals, unusual quantities of sawdust, and other waste into a stream, has been restrained in various jurisdictions.

The remedies of a riparian owner who is injured by pollution of a stream are to seek an injunction and damages in a court of equity, or sue for damages alone, in a court of law. Consult: Angell, *The Law of Watercourses* (7th ed., Boston, 1877); Haworth, *River Pollution* (1897); Gould, *Treatise on the Law of Waters* (3d ed., Chicago, 1900). See Nuisance; Riparian Rights.

POL′LUX. See Castor and Pollux.

POLLUX, Julius (Gk. 'Ιούλιος Πολυδεύκης, *Ioulios Polydeukēs*). A Greek lexicographer who was born at Naucratis in Egypt and flourished in the reign of the Emperor Commodus (180–192 a.d.). After a preparatory training under his father he studied under the Sophists and became a learned critic of grammar. He opened a school of rhetoric at Athens and won such fame that he became preceptor of the Emperor Commodus. He prepared for the use of the Emperor an *Onomasticon*, a Greek vocabulary divided into 10 books, designed to facilitate the learning of the Greek language by the young prince. It contains a variety of synonymous words and phrases, is useful in the study of Greek literature and art and of the Greek theatre, and is valuable also because in the first part it treats of the gods and their worship. Pollux was the author of several other works, of which Suidas has preserved the titles. The *Onomasticon* was published with Latin translation and commentary by Dindorf (5 vols., Leipzig, 1825), by Bekker (Berlin, 1846); the text was edited by E. Bethe (Leipzig, 1900). Consult J. E. Sandys, *A History of Classical Scholarship*, vol. i (2d ed., Cambridge, 1906); Christ-Schmid, *Geschichte der griechischen Litteratur*, vol. ii, part ii (5th ed., Munich, 1913).

POLNISCH-OSTRAU, pōl′nĭsh-ŏs′trou. A town in the Crownland of Silesia, Austria, on the Ostrawitza, opposite Mährisch-Ostrau, 60 miles west-southwest of Cracow. Its importance is owing to the extensive coal deposits of the neighborhood, which form the southwestern part of the great Upper Silesia coal belt. The town produces malt and liquors. Pop., 1900, 18,800; 1910, 23,151, chiefly Czechs.

PO′LO (from Tib. *pulu*, ball). A game played on horseback and closely resembling hockey (q.v.). While polo is the most ancient of all games of stick and ball, its introduction into England and thence into America is of relatively recent date. Having its origin in Persia, where certain odes thought to antedate the Christian era celebrate the glories of the game, it spread to Byzantium, Turkestan, and other Eastern centres until it came, by way of Tibet, to Hindustan. Little exact information can be gleaned about polo in India during its early days there. Several varieties, such as Gilgit and Manipur polo, still exist, but it was not until the later sixties that officers of English cavalry, lancers and hussars mainly, took to the game, promulgated rules, and systematized the play. Introduced in England, the sport at once sprang into favor, and the Hurlingham Club Polo Committee, established in 1875, is still the governing body of the game for Great Britain and her colonies. It may be said to be the headquarters of army polo, while the Ranelagh Club of Barnes occupies a like position in county polo. There are 41 clubs affiliated to the English County Polo Association. It is essentially an army game, and there are few regiments in the British service without one or more polo teams. In the United States the game is growing in popularity, particularly on the Pacific coast. Introduced in 1876 by James Gordon Bennett and fostered by H. L. Herbert, chairman of the American Polo Association, it gains every year in number of players. It is gratifying to Americans to remember that they have improved the game and instituted certain changes that were later adopted by English players. These changes were largely the outcome of the series of international matches for the American International Challenge Cup presented by the Westchester Polo Club, of Newport, R. I. Under the conditions the Hurlingham Club was to select the English team and (since 1901) the Polo Association of America the American team. The first match was played at Newport, R. I., in 1886, England winning both matches. In 1900, at Hurlingham, England again won. In 1902 England retained possession of the cup by winning two of the three matches. In 1909 the United States regained the cup after 23 years, winning two straight matches. The United States team, known sometimes as the "big four," consisted of H. P. Whitney, J. M. and L. Waterbury, and Devereux Milburn. In 1911, at Meadow Brook, L. I., this team defeated Hurlingham in two straight matches. Two years later the invading team met like defeat. In 1914 England regained the cup after five years, winning two straight matches. Harry Payne Whitney did not play, the new member being René La Montagne.

It was owing probably to the three successive defeats by the American team that England lost confidence in the polo tactics hitherto accepted, and adopted in a measure those of her successful adversaries. In a word, she discarded the close combination and short pass for the faster-riding and longer-hitting game of Whitney's men. Where the English team had been content with a scientific passing and relatively slow game, they found themselves opposed to a different and more successful type of play calling for harder and more accurate hitting than that to which they had accustomed themselves. That the adoption of this change aided their victory of 1914 is hardly open to doubt. The off-side rule, which has no place in the American game and has been modified in England, was another cause of the faster pace in America. So much faster has the game become of recent years that the time of the periods, or chukkers, has been reduced. Where formerly these periods were four 15-minute periods of play with seven minutes' rest between them, they are now, in a match game between teams of four, eight periods of seven and a half minutes each with three-minute intervals between all periods for change of ponies except after the fourth period, when a seven-minute interval is allowed. When polo was first brought from India the height of the ponies was lower than 14 hands. Later the Hurlingham authorities raised it to 14 hands and 2 inches. American players have not rigorously conformed to this standard, as has been seen in recent international matches. On March 17, 1915, the executive committee of the Polo Association meeting at the Whitehall Club changed the rule calling for ponies of 14 hands and 2 inches and permitted players to ride horses of 15 hands and 1 inch. The word "ponies" was changed to "mounts." As mounts of this height have been used constantly, this will hardly affect the pace of polo.

Polo is played on a field which should be 900 feet long by 450 feet wide. The goal posts are 24 feet apart, at least 10 feet high, and light enough to break if collided with. The balls are of wood (bamboo root, English willow, or basswood) having no covering but white paint, 3⅛ inches in diameter and not more than 5 ounces in weight. The mallets, from 50 to 56 inches long, are of malacca cane or rattan, with heads of maple, sycamore, bamboo, or ash. The game can be played by teams of two, three, or four players, but in discussing polo the match team of four players is invariably meant. A team is made up of players designated as numbers one, two, three, and back; one and two are forward, three is a half-back, and back protects the goal as the last line of defense. Number one usually rides off the opposing forward to give number two a chance to shoot for goal. A goal counts as one point, a safety minus one-quarter, and a foul minus one-half. A safety is when a player, to save his goal, hits the ball behind the goal line. This method of scoring penalties had its origin in the United States and modifies the fortunes of the game considerably. For instance, in the second international match of 1914, which England won, both teams scored five goals, but the American team lost two and a quarter points by penalties and the English team only one. Fouls may be claimed for foul riding or dangerous horsemanship.

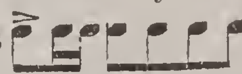
In order that players of varying degrees of skill may contend together on some sort of equal basis, a system of handicapping has been arranged. This does not apply to open or championship games. Teams whose handicaps aggregate less than those of their competitors are allowed the number of goals between their own handicap and that of their competitors. In tournament events the handicap of any player is not less than one goal. The highest handicap assigned in the United States is nine. Consult: T. F. Dale, *Polo, Past and Present* (New York, 1905); T. B. Drybrough, *Polo* (ib., 1906); E. D. Miller, *Modern Polo* (3d ed., ib., 1911).

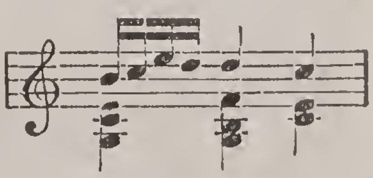
POLO, pō′lȯ, Gaspar Gil (c.1530–91). A Spanish poet, born at Valencia. Philip II appointed him, in 1572, coadjutor to the president of the upper financial chamber of the Kingdom of Valencia and in 1580 sent him to superintend the royal patrimony at Barcelona, where he died. Besides his *Canto de Turia* in praise of his native city, he wrote a notable continuation of Montemayor's *Diana,* under the title *Diana enamorada* (Valencia, 1564). A convenient edition is that of Francisco Cerdá y Rica (Madrid, 1778; new ed., 1802; consult also the edition in the *Biblioteca clásica española,* Barcelona, 1886). Polo's *Diana* was translated into English by Bartholomew Young (London, 1583–92).

POLO, Marco (c.1254–1324). The most celebrated traveler of the Middle Ages. He belonged to a noble Venetian family. His father, Nicolò Polo, and his uncle, Maffeo Polo, went about 1249 to the Crimea and from there journeyed to Cathay or China. Here they were received by the famous Kublai Khan (q.v.), returning home in 1269. When they set out again for the East, in 1271, Marco Polo, who had been born during his father's absence, went with them. The three travelers crossed western Asia and Tartary and reached China and the Great Khan in 1275. They were received with great honors, and young Marco received various high offices; at one time he administered a whole province for three years. The three Europeans finally became restless in this distant land, and, though the Khan was unwilling to allow them to depart, they at last obtained permission to accompany an embassy to Persia. From there they journeyed to Venice, reaching their native city in 1295. Marco Polo commanded a vessel in a war against Genoa in 1298, was taken prisoner, and was not released until the following year. Meanwhile he dictated in French an account of his journey to Rustichello of Pisa, who entitled the work *The Book of Marco Polo.* It was translated almost immediately from the French text of Rustichello into many other languages. For centuries it comprised all the knowledge Europe possessed of the extreme East, and though Marco Polo was at one time accused of exaggeration in many particulars, subsequent travels have proved the accuracy of his observations. Little is known of Polo's history after he left the Genoese prison, beyond the fact that a wife and three daughters survived him. Consult: C. R. Beazley, *Dawn of Modern Geography,* vol. iii (Oxford, 1906); the best edition of his work is that of Sir Henry Yule, *The Book of Sir Marco Polo* (3d ed., 2 vols., New York, 1903). Among the many other editions in English may be mentioned the one in the Bohn Library, edited by Thomas Wright (London, 1904). An edition called *Travels of Marco Polo,* translated by William Marsden, is to be had in the Everyman's Library (New York, 1908).

POLOCK. An ancient city of Russia. See Polotsk.

POLO DE MEDINA, pō′lȯ dȧ mȧ-ᴅē′nȧ, Salvador Jacinto (c.1607–c.60). A Spanish poet, born in Murcia. He took orders early in life, and when about 30 years old became secretary to the Bishop of Lugo. He wrote much satirical verse in his youth in the manner of Cervantes and Quevedo. His *Academias del jardin, Buen humor de las musas Apolo y Dafne,* and *Pan y Siringa* were all printed in 1630. His *Hospital de incurables, viaje de este mundo al otro* (1636), an imitation of Quevedo's *Sueños,* is in prose. He wrote also the elegant treatise *A Lelio, gobierno moral* (1657), which had great influence on the literature of his time. His *Obras en prosa y versa* were first published in 1664. His verse is printed in Rivadeneyra's *Biblioteca de autores españoles,* vol. xlii (Madrid, 1857).

POLONAISE, pō′lȯ-nāz′ (Fr., Polish), or Polacca. A Polish national dance of slow movement, in ¾ time. It always begins and terminates with a full bar, and a peculiar effect is produced by the position of its cadence. the dominant seventh in the second quarter of the bar preceding the triad on the third quarter. The characteristic rhythmic figure of the accompaniment is . At present the polonaise is more a promenade than a dance, taking the place of the older



entrée. Grove asserts that this dance was not originally a popular dance, but originated at the coronation of Henry of Anjou at Cracow (1574). This statement seems to be confirmed by the fact that the oldest polonaises were not dance songs, but purely instrumental pieces.

POLO′NIUM (Neo-Lat., from Lat. *Polonia*, Pol. *Polska*, Poland). A metallic element discovered in 1898 by Madame Sklodowska Curie. While studying the radioactivity of various minerals Madame Curie found that specimens of uraninite or pitchblende from certain localities showed more active radiation than metallic uranium, the principal metallic ingredient of uraninite. She thus became convinced that those minerals must contain some radioactive substance hitherto unknown, and further examination led her to the discovery of a new radioactive metal, resembling bismuth, for which she proposed the name "polonium." At first the elementary nature of polonium was questioned and it was said to be a mixture of bismuth and some unknown substance. The researches of Marckwald of Berlin and Debierne of Paris appeared to demonstrate the elementary nature of polonium and its identity with the radiotellurium found by Marckwald in substances containing tellurium. On the other hand, the substance called Radium F, produced in the gradual disintegration of radium, has been shown to be identical with polonium. The properties of polonium are similar to those of bismuth, although the metal resembles nickel in color. The special peculiarity of polonium is its wonderful radioactivity, which is said to be about three hundred times greater than that of uranium. Madame Curie and Debierne have shown that the radioactivity of polonium is accompanied by the evolution of helium (q.v.). Marckwald has shown that polonium intercepts a strong current of electricity passing through the air from a generator to the receiver, the air ceasing to be a conductor for the flashes, and that in the dark pieces of barium, platinum, and zinc sulphide, if placed near polonium, glow with a bright greenish light. The atomic weight of polonium is about 210. See RADIOACTIVITY.

POLO′NIUS. The chamberlain to the King of Denmark, and father of Ophelia and Laertes, in Shakespeare's *Hamlet*. Hidden behind the arras to overhear Hamlet and the Queen, he is killed by the former, who thinks it is his uncle attempting concealment.

POLON′SKY, YAKOV PETROVITCH (1819–98). A Russian lyric poet. He was born at Riazan, studied at Moscow University (1840–44), and traveled extensively in Russia and abroad. On settling in St. Petersburg he edited the periodical *Rysskoé Slovo* (1859–60) and then joined the Board of Foreign Censorship, with which he was connected till his death. In 1896 he became a member also of the chief government bureau of printing. His long literary career began in 1844 with a collection of verse entitled *Gamuts.* His prose includes the novels *Sleepy Hills, A Cheap Town,* and *Sergei Tchalygin's Confession* (all 1888). Of his poetry 13 collections were published, the latest in five volumes (St. Petersburg, 1896). An edition of all his works to date appeared in 1885–86 (10 vols., St. Petersburg). Polonsky is essentially a household poet. His lyrics, many of them set to music, are widely popular.

POLOTSK, pŏ′lŏtsk, or POLOCK. An ancient city of the Government of Vitebsk, Russia, situated on the Düna, 63 miles northwest of Vitebsk (Map: Russia, C 3). Its two ancient castles are now in ruins and a new church stands on the site of the church of St. Sophia, originally founded in the twelfth century. There is a seminary for teachers. The chief manufactures are leather, pottery, tobacco, soap, and candles. Pop., 1910, 31,111, about 50 per cent Jewish. Polotsk was the capital of a mediæval principality, which was absorbed by Lithuania. In the sixteenth century it was a prosperous and splendid city, but was subsequently ruined by war and plague. It was taken by Russia in the first partition of Poland in 1772. It was the scene of severe conflicts between the Russians and the French during the Napoleonic invasion of Russia in 1812.

POLTAVA, pŏl-tä′vȧ, or **PULTOVA,** pụl′-tȧ-vȧ. A government of Little Russia, bounded by the Government of Tchernigov on the north, Kharkov on the east, Ekaterinoslav and Kherson on the south, and Kiev on the west (Map: Russia, D 5). Area, about 19,265 square miles. The surface is undulating, slightly elevated in the north and with a general incline towards the valley of the Dnieper in the southwest. It belongs to the basin of the Dnieper, by which river it is skirted on the southwest. The climate is moderate and steady, the annual temperature at Poltava, the capital, averaging about 46°. Poltava belongs to the black-soil region of European Russia and is one of the chief grain-producing districts of the Empire. Agriculture is the principal occupation and is carried on on very primitive lines, modern machinery and fertilizers being confined principally to large estates. The leading products are rye, oats, and wheat, which are raised in quantities far above the domestic demand. The sunflower and flaxseed are cultivated for the production of oil, and tobacco raising is important. The vegetables of Poltava, especially the melons, are famous all over Russia. Stock raising, especially the breeding of horned cattle, is of great importance, since oxen are used chiefly as draft animals and for agricultural purposes. The government has few manufacturing industries, and these are connected with agriculture or gardening. The principal manufactures are flour, oil, tobacco, sugar, etc. Pop., 1913, 3,716,400, more than 95 per cent Little Russians, Jews, Poles, and Germans. Capital, Poltava. The Russians began to settle in the region in the tenth century, but their settlements were destroyed during the Mongol invasion and the territory was taken possession of by Lithuania in the fourteenth century. Later it passed to Poland. By the Andrusovo Treaty (1667) it fell to Russia. The present government was formed in 1802.

POLTAVA, or **PULTOVA.** The capital of the government of the same name, Little Russia, on the Vorskla River, about 70 miles southwest of Kharkov (Map: Russia, D 5). Outside of the town is situated a monastery dating from 1650. Near it is the monument known as the Swedish Tomb, commemorating the victory of the Russians over the Swedes. The educational institutions of the town comprise two Gymnasia, a Realschule, a cadet corps, an institute for daughters of noblemen, a seminary for priests, and a number of Jewish schools. Industrially the town is of considerable importance, carrying on an important trade in horses, cattle, and grain, though its fairs have virtually lost their former significance. Pop., 1911, 83,841, including a considerable number of Jews. Poltava is famous as the scene of the signal victory of the Russians under Peter the Great over the Swedes under Charles XII, on July 8, 1709.

POL′YÆ′NUS (Lat., from Gk. Πολύαινος, *Polyainos*) (c.85–c.170). A Greek rhetorician. He was born in Macedonia, lived in Rome, and about 163 wrote in Greek a work entitled *Strategica* or *Strategemata*, rated highly by the Roman emperors. Of its eight books parts of two (vi, vii) are lost. The sources also are mostly gone, so that the work contains much historical information for which there is no other authority. It was edited by Casaubon (1589) and by Wölfflin (1887). Consult Christ-Schmid, *Geschichte der griechischen Litteratur*, vol. ii, part ii (5th ed., Munich, 1913).

POL′YANDRY (from Gk. πολυανδρία, *polyandria*, populousness, from πολύανδρος, *polyandros*, having many men, from πολύς, *polys*, much, many + ἀνήρ, *anēr*, man). That form of marriage and the family in which a woman has more than one husband at a time. There are two well-marked types of polyandry, in one of which, called Nair polyandry, the husbands are usually not related to one another, and the Tibetan, or fraternal polyandry, in which the husbands are brothers. Either of these forms may shade into a relationship which would have to be described as a combination of polyandry and polygyny, each husband having more than one wife, as each wife has more than one husband. A family scheme similar to this existed in the Hawaiian Islands when they first became known to Europeans, and was there known as the Punaluan family, and this name has been adopted into ethnology. In one or another form polyandry has been widely distributed. It has only lately disappeared from Ceylon, New Zealand, New Caledonia, and elsewhere in the Pacific islands. It is still found among the Koryaks north of the Okhotsk and among the Zaporogian Cossacks. In Africa it is found among the Hottentots, among the Damaras, and among mountain tribes of the Bantu race, and traces of it remain among the Hovas of Madagascar. Cæsar notes its existence in his day among the Picts and the Irish, and many evidences of its former occasional existence in other Aryan stocks and throughout the Semitic and the Hamitic races have been brought together by McLennan, Spencer, and W. Robertson Smith. See MARRIAGE.

POL′YAN′THUS (Neo-Lat., from Gk. πολύανθος, having many flowers). A hardy perennial plant, much prized, and cultivated in gardens. It has been developed from *Primula variabilis*, which itself is a hybrid between the common primrose (*Primula vulgaris*) and the English cowslip (*Primula officinalis*). The numerous flowers are borne above the foliage in an umbel supported on a common leafless flower stem, or scape. It exhibits a variety of delicate and beautiful colors. If a particular color is to be preserved the plants are propagated by divisions. A rich soil, shade, and moisture are most suitable for its growth.

POL′YBA′SITE. A sulphantimonite of silver, occurring in monoclinic crystals, and found with other silver ores in Mexico, Chile, Nevada, Colorado, and Arizona.

POLYB′IUS (Lat., from Gk. Πολύβιος, *Polybios*) (c.205–c.120 B.C.). The chief Greek historian of the Hellenistic period, born at Megalopolis in Arcadia. He was the son of Lycortas, a general of the Achæan League (see ACHÆA), and an intimate friend of Philopœmen (q.v.). His birth and great talent early secured him important political positions in his native city. In 181 B.C. he was chosen as member of the embassy which was to visit Alexandria, but which was afterward given up; in 169 he held the office of hipparch in the Achæan League. After the conquest of Macedonia in 168 he was one of the thousand noble and influential Achæans who were taken to Rome as hostages. There he remained 17 years. Through some good fortune he soon gained the friendship of Æmilius Paulus (q.v.) and his sons, with whom he resided during a large portion of his exile. The younger Scipio Africanus became strongly attached to him and took him as companion on his journeys in northern Italy and also in his military expeditions against the Celtiberians in Spain. In 150, together with his fellow exiles, he was allowed to return to his home, but during the Third Punic War he rejoined Scipio, accompanied him on his African campaign, and was present at the destruction of Carthage in 146. The outbreak of war between the Achæans and the Romans called him again to Greece, where he was of the greatest service, through his influence with the Romans, in procuring favorable terms for the vanquished. So grateful were his countrymen for his services in their behalf that Megalopolis, Mantinea, and many other towns erected statues in his honor. It is said that he met his death by a fall from a horse.

Polybius' chief work is his *Histories*, in 40 books, of which the first five have come down to us complete; we also have considerable portions of the first 18 books, preserved in a codex of Urbino and also the important excerpts of Constantinus Porphyrogenitus. The purpose of this history was to explain how, in less than 60 years (220–168 B.C.), all the known regions of the civilized world had come under the sway of Rome. Polybius devoted the first two books of his work to an introductory sketch of Rome and Carthage from 266 to 221. From this point it is a general history of the times, including the important events in Greece, Asia, and Libya, as well as in the West. The history to 168 B.C. occupied books iii–xxx, while the last 10 books brought the narrative down to the year 146. Polybius seems to have begun his work as early as 150, and the composition of it apparently extended over about 25 years.

Polybius is the first great example of a writer of history on the pragmatic method. He endeavored not simply to present facts, but also to ascertain the causes of these facts, and to draw from them lessons valuable for the future. On the other hand, his tone is too didactic in general, and the continuity of his narrative is too often interrupted by digressions. His style is clear, but without grace or charm; he incurred the censure of later Greek critics for carelessness in the choice of words and in the structure of sentences. His work, however, marked an epoch in the history of Greek literary style, for with it begins the period of the so-called common dialect, a slightly modified Attic. The best annotated edition is by Schweighäuser (8 vols., Leipzig, 1789–95); there are critical editions by Bekker (Berlin, 1844), Dindorf (last ed., Leipzig, 1882–89), Büttner-Wobst (5 vols., Leipzig, 1882–1904), and also by

Hultsch (2d ed., ib., 1888; Eng. trans. by Shuckburgh, London, 1889). Consult: R. von Scala, *Die Studien des Polybius* (Leipzig, 1890); O. Cuntz, *Polybius und sein Werk* (ib., 1902); J. B. Bury, *Ancient Greek Historians* (New York, 1909); J. L. Strachan-Davidson, in an annotated edition of *Selections from Polybius* (Oxford, 1888); W. C. Wright, *A Short History of Greek Literature* (New York, 1907); Christ-Schmid, *Geschichte der griechischen Litteratur*, vol. ii, part i (5th ed., Munich, 1911).

POL′YBO′TES (Lat., from Gk. Πολυβώτης). A giant pursued by Poseidon after the struggle of the giants (q.v.) with the gods, and who was buried under a portion of the island of Cos, which Poseidon in wrath tore away and hurled upon him.

POL′YBUS (Lat., from Gk. Πόλυβος, *Polybos*). A king of Corinth, foster father of Œdipus (q.v.).

POL′YCARP (Lat. *Polycarpus*, from Gk. Πολύκαρπος, *Polykarpos*) (c.69–155). Bishop of Smyrna and one of the most celebrated early Christian martyrs. Such meagre information as we have about his life is drawn chiefly from Irenæus, Eusebius, and the anonymous *Martyrdom of Polycarp*. As a youth he came in contact with the Apostle John, and thus he constitutes an important link between him and Irenæus (q.v.). When Ignatius passed through Asia Minor on his way to death in Rome early in the second century, he visited Polycarp, then already Bishop of Smyrna, and to him he afterward addressed a letter. (See IGNATIUS OF ANTIOCH.) So far as we know, most of Polycarp's life was passed in the peaceful administration of his see. One of his last acts was to visit Anicetus, Bishop of Rome, to confer with him respecting the time of celebrating Easter (q.v.). Soon after his return to Smyrna Polycarp was arrested by the officers of the Roman government, tried on the charge of being a Christian, and condemned to death by burning. He suffered martyrdom on Feb. 23, 155 (not 166, as was formerly supposed), at the advanced age of 86 years, and perhaps older. Such was the sanctity of his life and such his heroism in martyrdom that his memory and his relics were always held in the deepest veneration. Polycarp is said to have written several letters, only one of which, however, that to the Philippians, has come down to us. Its authenticity has been doubted, but on insufficient grounds. The epistle is extant partly in the original Greek, and as a whole in a loose Latin translation. The *Martyrdom of Polycarp* is an early document giving a probably authentic account of his trial and death, with slight traces of legendary development. Both these works are included among the Apostolic Fathers, and may be read, in English translation, in Harmer's one-volume edition of Lightfoot's *Apostolic Fathers* (London, 1898), and in the Loeb Library (New York, 1912–13). Consult: J. B. Lightfoot, *The Apostolic Fathers*, part ii, *Ignatius and Polycarp* (2d ed., London, 1889); Adolf Harnack, *Chronologie der altchristlichen Litteratur* (Leipzig, 1897); C. T. Cruttwell, *Literary History of Early Christianity* (2 vols., New York, 1899); F. X. Funk, *Patres Apostolici* (Tübingen, 1901).

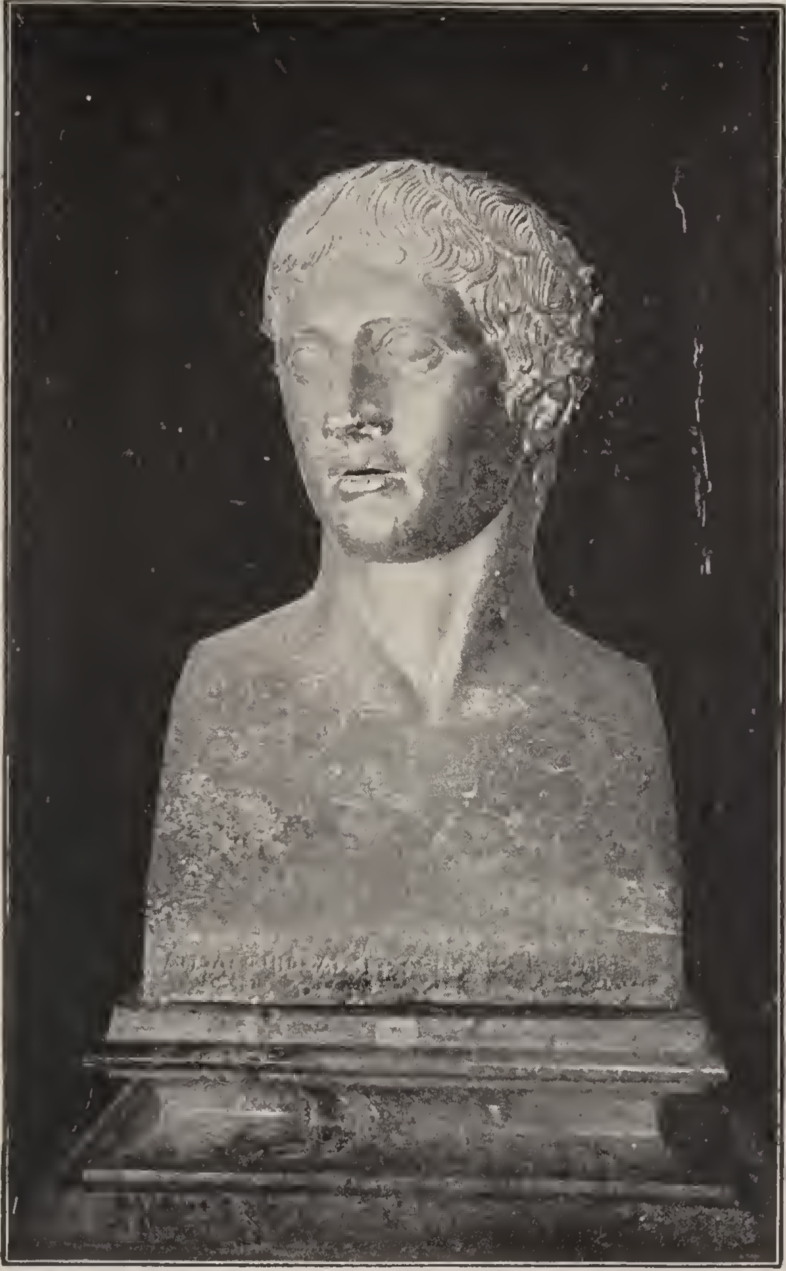
POL′YCHROME BIBLE (from Gk. πολύχρωμος, *polychrōmos*, many-colored, from πολύς, *polys*, much, many + χρῶμα, *chrōma*, color). An edition of the books of the Old Testament printed in different colors, sometimes called the rainbow Bible, to show the various literary sources represented, according to the view of modern scholars. The series has been issued in both Hebrew and English under the editorship of Prof. Paul Haupt of Johns Hopkins University, with the help of some of the foremost scholars of Europe and America. The first numbers were issued in 1894, but the great expense of the undertaking caused its intermission for a time.

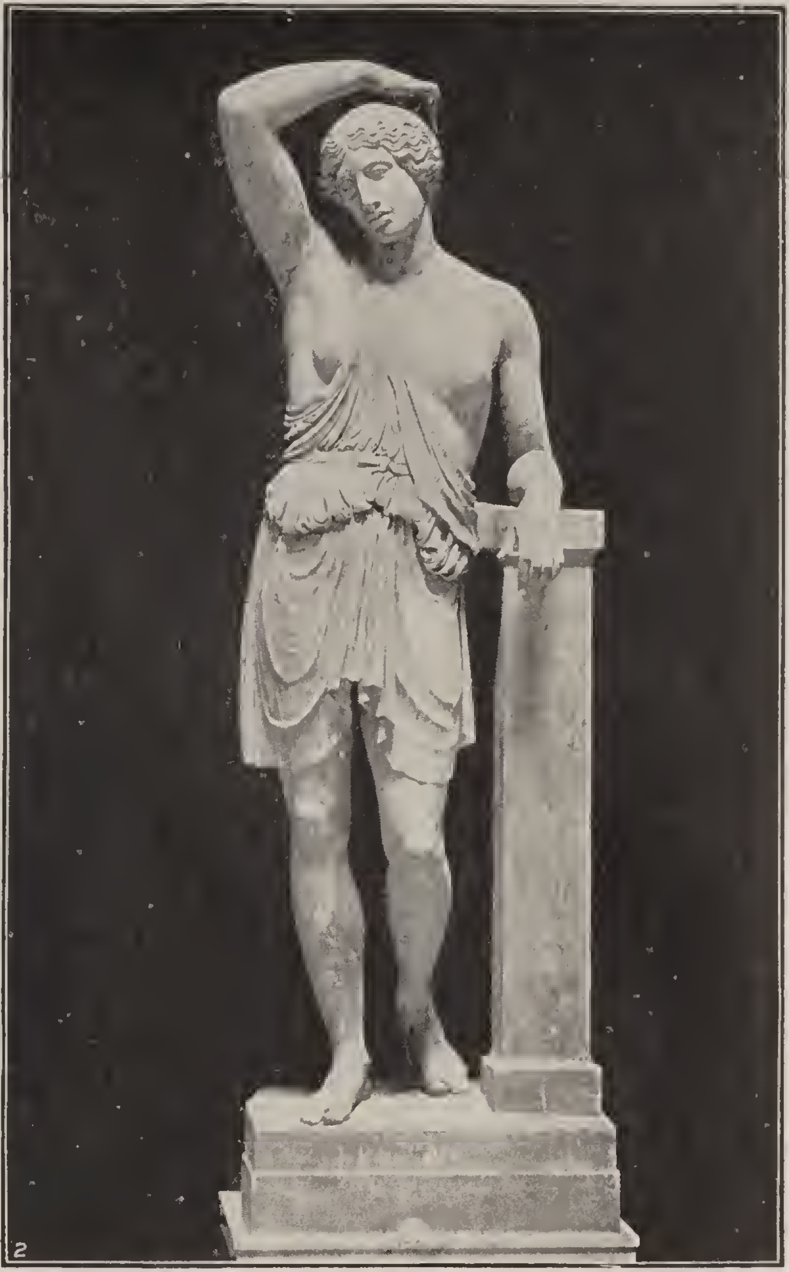
POLYCHROMY, pŏl′ĭ-krō′mĭ (from Fr. *polychromie*, Gk. πολύχρωμος, *poluchrōmos*, from πολύς, polus, many + χρώμα, *chrōma*, color). The use of colors in decoration, especially in architecture and sculpture. Variegated color appears to be the most important resource of primitive decorators, and all the works of the earlier styles both of architecture and of sculpture were adorned with color. Egyptian and early Greek statues were painted, the exposed parts of the figure with a tint somewhat suggesting conventional flesh color, the draperies with patterns like those of actual fabrics. Both the interiors and large portions of the exteriors of Egyptian temples were covered with pictures, symbols, and hieroglyphs, incised or carved in low relief and richly painted, or sometimes, as at Abydos, painted flat on a coating of thin stucco. Chaldæan and Assyrian buildings were adorned with bands and friezes of encaustic tiles, or with facings of enameled bricks, in black and rich shades of blue, yellow, and green. Greek architecture employed red, blue, green, and yellow freely; the triglyphs were blue and the metopes red; the moldings were enriched with painted ornament; the ceiling panels were blue, with gold ornaments; it is possible that both walls and columns were tinted. See illustration of model of Parthenon under ARCHITECTURE.

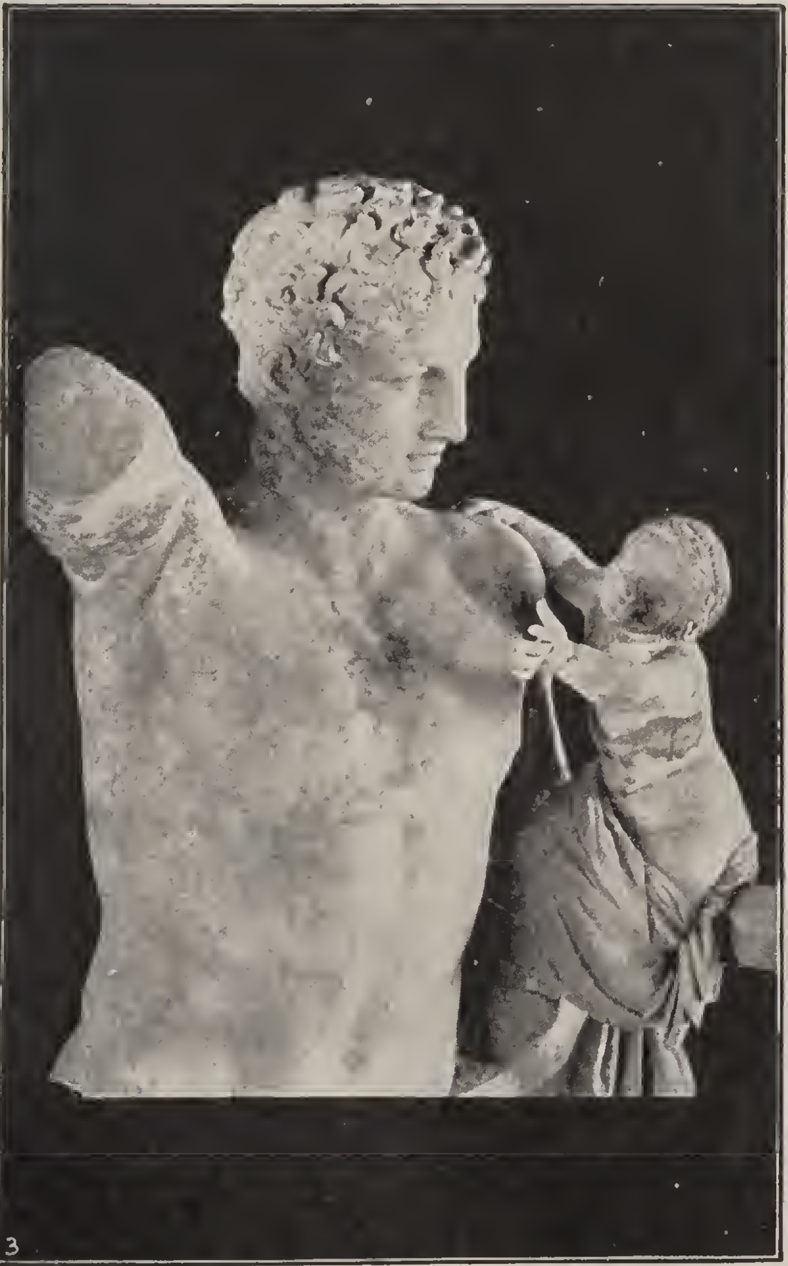
The Romans employed mural painting and mosaic in their interiors (see INTERIOR DECORATION), and added to this the splendid resource of richly colored building materials—marbles, granites, and porphyry—which they used for column shafts and, in large slabs, for wall incrustation, besides the decoration of floors with various forms of mosaic (q.v.). It is possible that this use of natural polychromy was derived from late Greek or Greco-Egyptian prototypes, but it was developed by Rome into a splendid system which was perpetuated by the Byzantines, who added to it the further splendor of glass mosaic on a golden background (see BYZANTINE ART), though they employed mural painting in fresco and distemper also. The mediæval artists outside of Italy abandoned mosaic, but painted certain parts of their church interiors, especially the vaults and the choir or chapels, and all their decorative sculpture as well as parts of the woodwork. Even when broad color was not employed, moldings and capitals were picked out in red, green, blue, and gold. But their supreme achievement in color was in the superb stained glass (q.v.) of their great windows. In Italy was developed a marvelous art of external natural polychromy, by the use of colored marble in shafts, bands, and inlaid patterns, and even of glass mosaic. The façades of the cathedrals of Orvieto and Siena, and both the interior and exterior of St. Mark's at Venice are the most splendid examples of this art.

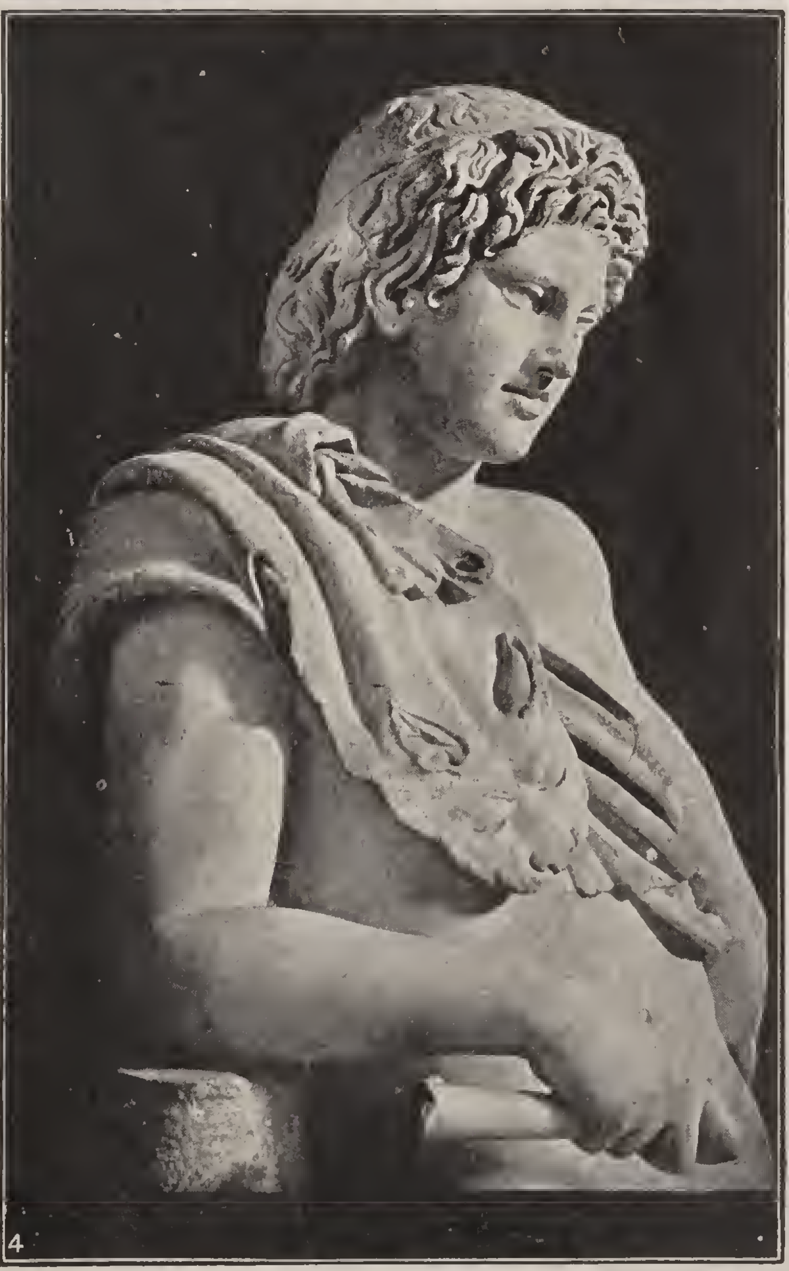
Except in the field of interior decoration the Renaissance artists of Europe generally abandoned the use of strong external color, natural

POLYCLITUS AND PRAXITELES









1. **HEAD OF THE DORYPHORUS,** Copy in Bronze, Naples Museum.
2. **AMAZON OF POLYCLITUS,** Copy in Marble, Berlin Museum.
3. **UPPER PORTION OF THE HERMES OF PRAXITELES,** Original, Marble, Olympia Museum.
4. **UPPER PORTION OF THE FAUN OF PRAXITELES,** Copy in Marble, Capitoline Museum, Rome.

or applied. But all the Oriental schools and styles of art have continued to employ rich polychromy both externally and internally. The marble inlays of Cairo, the brilliantly colored relief patterns in stucco of Moorish Spain, the superb tiles of Turkey and Persia, the lacquered woodwork of Japan, the inlays of India and her tombs and palaces of red sandstone and white marble, are in their own field unequaled. In modern art polychromy has been sadly neglected, but there are signs of a new and increasing interest in its use. Consult: Hitorff, *L'Architecture polychrome* (Paris, 1851); Owen Jones, *Grammar of Ornament* (London, 1910); Racinet, *L'Ornement polychrome* (Paris, 1869–87); Ward, *Colour Decoration in Architecture* (London, 1914); and the bibliographies under the different styles and under INTERIOR DECORATION.

POL'YCHRON'ICON (Neo-Lat., from Gk. πολύς, *polys*, much, many + χρονικός, *chronikos*, relating to time, from χρόνος, *chronos*, time). A history of the world from the creation down to the year 1342 by Ranulf Higden, a Benedictine monk, who died about 1363.

POL'YCLI'TUS (Lat., from Gk. Πολύκλειτος, *Polykleitos*). 1. A Greek sculptor in bronze. He is called by Plato and other ancient writers an Argive, and was certainly the representative of that school in Greek art. The only authority for his birth at Sicyon is Pliny, who seems to have drawn on a history by a Sicyonian, who claimed for his native city the honor of being the birthplace of the greatest Argive artist. His chryselephantine Hera at Argos probably dates shortly after 433 B.C., for it was in the new temple built immediately to replace the old sanctuary that was destroyed by fire at that date. It is possible that the statue of Zeus Meilichios at Argos was a later work than this. That Polyclitus may well have been a pupil of Ageladas is shown by an Oxyrhynchus papyrus, wherein his earlier statues of Olympic victors are dated in 452 and 460 B.C. The earliest work of his of which we have record is the statue of Cyniscus, who won the boxing match for boys in the neighborhood of 460. At Olympia the bases of other athlete statues bearing Polyclitus' name have been found. Two are in honor of Pythocles and Aristion, who were winners in 452. All this evidence shows that Polyclitus was working virtually at the same time as Phidias (q.v.). In technical skill, delicacy of finish, and beauty of line he ranked with the greatest artists of his time, but ancient critics missed in his works the sublimity that marked the statues of Phidias. He followed in the lines already characteristic of the Peloponnesian school. His figures are marked by a powerful muscular frame, while the face is square rather than oval, with broad brow, straight nose, and small chin, with the lines sharply defined, presenting a somewhat striking contrast to the fine oval which is characteristic of the Attic school. A careful student of proportions, Polyclitus embodied his theories not only in writing (if this is the meaning of the canon attributed to him), but in his statues, and especially in the Doryphorus (see ATHLETE, THE), of which the best marble copy is in Naples, while the head is represented in a bronze bust from Pompeii. Of the same character, but softer in its lines, is the Diadumenos (q.v.), or youth binding a fillet round his brow, which is preserved in several marble replicas, of which the best was found in a private house on the island of Delos. His statue of an Amazon is almost certainly reproduced in a marble at Berlin, and his strongly marked characteristics in form and pose render it possible to attribute to him or his school the originals of a number of other works. 2. A younger Polyclitus, possibly a nephew of the great sculptor, flourished in the next century, and enjoyed a high reputation not only as a sculptor, but likewise as an architect. He built the theatre in the sanctuary of Asclepius at Epidaurus, greatly and justly famed for the beauty of its proportions, and the Tholos, or circular building, of which the use is uncertain, at the same place. See GREEK ART.

Bibliography. Adolf Furtwängler, *Masterpieces of Greek Sculpture*, translated by E. Sellers (New York, 1895); Mähler, *Polyklet und seine Schule* (Leipzig, 1902); E. A. Gardner, *Six Greek Sculptors* (London, 1910); id., *A Handbook of Greek Sculpture* (ib., 1911); R. B. Richardson, *Greek Sculpture* (New York, 1911); H. H. Powers, *The Message of Greek Art* (ib., 1913).

POLYC'RATES (Lat., from Gk. Πολυκράτης, *Polykratēs*). A tyrant of Samos (q.v.), born in the earlier half of the sixth century B.C. Nothing is known of him until about 535 B.C., when, with the assistance of his brothers, Pantagnotus and Syloson, and a small band of conspirators, he seized the government of the island. After a short time Polycrates made himself sole despot, conquered several islands of the Ægean archipelago and even some towns on the Asiatic mainland, waged war successfully against the inhabitants of Miletus, and defeated their allies, the Lesbians, in a great sea fight. His fleet, which was probably the most powerful in all Greece, amounted to 100 armed ships, and he had a force of 1000 mercenary bowmen. He was in intimate alliance with Amasis, King of Egypt, but this was ultimately broken off, according to Herodotus, by Amasis, who became alarmed at the uninterrupted good fortune of Polycrates. It was said that Amasis wrote a letter to Polycrates, earnestly advising him to throw away the possession that he deemed most valuable and thereby avert the displeasure of the envious gods. Polycrates, in compliance with this advice, cast a signet ring of marvelously beautiful workmanship into the sea; but when a fisherman presented the tyrant with an unusually big fish that he had caught, in its belly was found this same ring. It was quite clear now to Amasis that Polycrates was a doomed man, and he immediately broke off their alliance. Grote suggests that Polycrates, with characteristic perfidy, abandoned the Egyptian for a Persian alliance when he found the latter likely to be of more value to him in his ambitious designs. When Cambyses (q.v.) invaded Egypt (525 B.C.) Polycrates sent him a contingent of 40 ships, in which he placed all the Samians disaffected towards his tyranny, telling the Persian King not to let them come back. In some way or other they escaped the fate that Polycrates had designed for them, returned to Samos, and made war against the tyrant, but without success. Thereupon they went to Sparta and succeeded in securing the help of both the Spartans and the Corinthians. A force of Samians, Spartans, and Corinthians embarked for Samos and attacked the capital. After vainly besieging it for 40 days they sailed away, and Polycrates now became more powerful than ever. But a certain Orœtes, a Persian satrap of Sardis, had, for unknown reasons, conceived a deadly hatred of Polycrates, and having, by appealing to his cupidity, enticed the latter to visit him, he seized and crucified him, about 522 B.C. Polycrates was a patron of literature and the fine arts, adorned and equipped Samos with public works on a large scale, among which were a famous aqueduct and a temple of Juno, and had many poets and artists about his court, among the former being Anacreon (q.v.). Consult Robert von Pöhlmann, *Grundriss der griechischen Geschichte* (5th ed., Munich, 1914).

POLYD′AMAS (Lat., from Gk. Πολυδάμας). 1. One of the Trojan heroes, son of Panthous and friend of Hector. 2. A Thessalian victor in the Pancratium in the Olympic games of 408 B.C., noted for his size and enormous strength, which caused him to be invited to the court of Darius Ochus.

POL′YDEC′TES (Lat., from Gk. Πολυδέκτης, *Polydektēs*). The son of the King of the island of Seriphus, turned into a stone by Perseus (q.v.) with the head of Medusa for attempting to force Danaë to marry him.

POL′YDEU′CES. See CASTOR AND POLLUX; POLLUX, JULIUS.

POL′YDIP′SIA (Neo-Lat., from Gk. πολυδίψιος, *polydipsios*, very thirsty, from πολύς, *polys*, much, many + δίψα, *dipsa*, thirst). Excessive thirst is a symptom of most diseases attended by a high temperature, but particularly of diabetes mellitus and diabetes insipidus. On this account diabetes insipidus has been called polydipsia, although the term is no longer used in this sense. In diseases attended with profuse watery discharges from the bowels, as cholera Asiatica, excessive thirst is a prominent symptom, and an unusual desire for fluids is common in chronic gastritis and cancer of the stomach. See DIABETES.

POLYDOOR DE MONT, pȯ̆′lĕ̇′dōr′ de môɴ′, KAREL MARIE. See POL DE MONT, K. M.

POL′YDO′RUS. See ILIONA.

POLYEUCTE, pȯ̆′lē̇-ẽkt′. 1. A tragedy in five acts by Corneille, published with a dedication to Anne of Austria in 1642. Polyeucte is the husband of Pauline, daughter of the Roman proconsul Felix. The character of Pauline is one of Corneille's finest creations. 2. An opera in five acts by Gounod (1878) with libretto by Barbier and Carré.

POLYG′ALA (Lat., from Gk. πολύγαλον, *polygalon*, milkwort, from πολύς, *polys*, much, many + γάλα, *gala*, milk). A large genus of annual and perennial herbs and small shrubs of the family Polygalaceæ, natives chiefly of warm and temperate climates. *Polygala vulgaris*, common milkwort, is a small perennial plant, with an ascending stem, linear-lanceolate leaves, and terminal racemes of small but beautiful blue, pink, or white flowers, having a finely crested keel. It grows in dry, hilly pastures. Many species are natives of North America. *Polygala senega* is a North American species with erect, simple, tufted stems, about 1 foot high, and terminal racemes of small white flowers. The root, which is woody, branched, contorted, and about ½ inch in diameter, is the Senega root, Seneka root, or snakeroot of the United States, famous as an imaginary cure for snake bites. *Polygala crotalarioides* is similarly employed in the Himalayas. In tropical west Africa *Polygala butyracea*, known as cheyi, is a common plant, the seed of which contains an edible oil and the stems yield a fibre used by the natives for making cloth, thread, fishing nets, etc. *Polygala senega* is used in medicine as an expectorant, emetic, and diuretic. In the United States the roots of *Polygala alba*, *Polygala boykinii*, and others which as drugs are considered inferior to *Polygala senega* are aften collected and mixed with that species. The bark of the roots of *Monnina polystacha* and *Monnina salicifolia*, plants related to *Polygala*, is used in Peru as a substitute for soap. See cut in article CLEISTOGAMOUS FLOWERS.

SENEGA SNAKEROOT (*Polygala senega*).

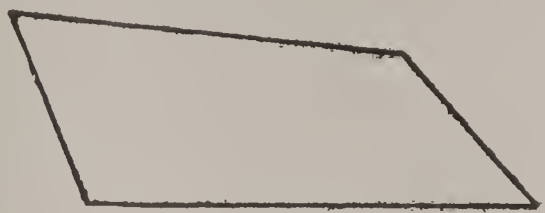
POLYG′AMY (from Gk. πολυγαμία, *polygamia*, plural marriage, from πολύγαμος, *polygamos*, much married, from πολύς, *polys*, much, many + γάμος, *gamos*, marriage). That form of marriage and the family in which a man has two or more wives. Strictly speaking, polygamy, meaning plural marriage, includes polyandry (more than one husband) as well as polygyny (more than one wife). Polygyny is found in all climes and among all races—Fuegians, Australians, Negritos, the Malayo-Polynesians, American Indians, and peoples of Africa. It flourishes in China and in Turkey, and in former ages it prevailed among the peoples of western Asia. It seems not to have been practiced to any extent by Greeks or Romans, and its occurrence among Celts and Germans was occasional. Tacitus says of the Germans of his day that "almost alone among barbarians" they "are content with one wife"; but he notes a few exceptions of noble birth. Polygamy never has been the only family form in any tribe or nation. Usually it has been only the relatively well-to-do and the powerful that have maintained polygamous families, while the majority of men and women have commonly lived in monogamous relations, the very poor resorting at times to polyandry. See MARRIAGE.

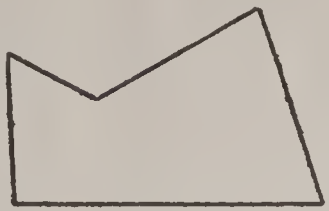
POL′YGLOT (from Gk. πολύγλωττος, from πολύς, much, many + γλῶττα, tongue, language). A book containing the same subject matter in more than one language, generally arranged for convenience in parallel columns. Of such books editions of the Bible are most common and are generally meant by the term "polyglot." Various versions of the Hebrew Old Testament (such as the *Hexapla* of Origen, q.v.) and of the Greek New Testament were thus united for convenience at various times. There are four great biblical polyglots: 1. The *Complutensian Polyglot,* in six folio volumes, begun in 1502, printed from 1513 to 1517 at Alcalá de Henarez (the Roman Complutum, whence the name Complutensian), Spain, and published in 1520. Spanish scholars edited the work under the patronage of Cardinal Ximenes. This polyglot contains the Old Testament in Hebrew, the Targum of Onkelos on the Pentateuch, the Septuagint, the Vulgate, and the Greek New Testament. Only 600 copies were printed. 2. The *Antwerp Polyglot, Biblia Regia,* issued from the famous Plantin printing house in Antwerp. This was prepared under Spanish auspices also, Philip II bearing the cost and sending the scholar Arias Montanus to Antwerp to edit it. With the editor were associated some of the most famous Orientalists and philologians of the time. In eight folio volumes, published between 1569 and 1572, this work contains the Hebrew and Greek of the Old Testament, the Targum of Onkelos, and other Aramaic paraphrases, the Vulgate, and the Greek and a Syriac version of the New Testament, besides lexicons, grammars, etc. It is very rare now owing to the early loss of a great many copies by accident. 3. The *Paris Polyglot,* in 10 great folio volumes, issued between 1628 and 1645 in Paris by Antoine Vitré at the expense of Guy Michel le Jay. In addition to the texts of the Antwerp Polyglot which it reprinted, it published for the first time the Syriac version of the Old Testament and the Arabic version of the whole Bible. Unfortunately the scholarly character of this great work is very poor. 4. The most complete of all polyglots is the *London* or *Walton's Polyglot,* published in six folio volumes, from 1654 to 1657, under the editorship of Brian Walton. The first copies were dedicated to Oliver Cromwell, who had greatly favored the undertaking. The second set was dedicated to King Charles II, and the former patron, Cromwell, is branded as "the great Dragon." It contains the entire Bible, or some portion of it, in Hebrew, Samaritan, Aramaic, Syriac, Arabic, Ethiopic, Persian, Greek (with a literal Latin translation of each), and Latin. This is the most valuable polyglot ever issued. The best Orientalists of the time in England assisted Walton, whose own *Prolegomena* (p. 102 of vol. i) is still of abiding value (republished separately, 1828). A dictionary of all the languages represented except the Greek and Latin, called *Lexicon Heptaglotton,* was published as an addition to this polyglot by Edmund Castle in 1669. Of minor polyglots mention may be made of *Bagster's* (London, 1831), which contains the entire Bible in Hebrew, Greek, English, Latin, French, Italian, Spanish, and German, with a Syriac version of the New Testament in addition. Consult Tregelles, *An Account of the Printed Text of the Greek New Testament* (London, 1854); B. Pick, in *Hebraica,* vol. ix (1892–93); E. Nestle, in Hauck-Herzog, *Real-Encyklopädie,* vol. xv (Leipzig, 1904).

POL'YGNO'TUS (Lat., from Gk. Πολύγνωτος, *Polygnōtos*). A Greek painter of the middle of the fifth century B.C. He was the son of Aglaophon and a native of the island of Thasos, where his family were artists. He appears to have come to Athens shortly after the Persian wars, to have won citizenship there, and to have found abundant scope for his talents in the decoration of the great buildings that mark this period. Along with the Ionian Micon and Panænos, brother of Phidias, he is said to have decorated the Theseum, the Stoa Pœcile (or painted portico), and the Anakeion, or temple of the Dioscuri, with paintings from legend and recent history, though the division of the paintings among the artists was not certainly known. The first building contained the battles of the Athenians with the Amazons and of the Lapithæ with the Centaurs, and the descent of Theseus to Amphitrite in the depths of the sea. In the Stoa were represented the capture of Troy and the council of the Greeks to judge Ajax, son of Oïleus, for his outrage on Cassandra, which was certainly by Polygnotus, also the battle of Theseus with the Amazons, the battle of Marathon, and the victory of the Athenians and the Argives over the Spartans at Œnoe, of which the second was by some attributed to Polygnotus. In the Anakeion he painted the Dioscuri carrying off the daughters of Leucippus. In the temple of Athena Areia at Platæa was a painting by him representing the slaughter of the suitors by Odysseus. Some frescoes in the Propylæa at Athens were also attributed to him. Most celebrated and best known from the descriptions by Pausanias, the Greek periegete, are the great paintings in the Lesche (or porch) at Delphi, representing the departure of the Greeks from Troy and the descent of Odysseus to the lower world. As is clear from these subjects, Polygnotus devoted himself to extensive compositions containing many figures the grouping and characterization of which required careful study. At the same time his means were simple. Black, white, red, yellow, blue, and green were his colors; light and shade were unknown, and the strength of the artist lay in his beauty of outline and coloring, and above all in his delineation of character. His subjects led him to arrange his figures on various levels, and for this reason he chose when possible sloping ground, which could be easily indicated by waving lines and the partial concealment of some of the figures. His influence was very marked, not only on painting, as is clear from a group of Attic vases, but also on sculpture, and it is probable that the reliefs at Tryso (Gyöl-bashi) reflect his art, or that of the Ionian school, of which he was the greatest exponent. See GREEK ART.

Bibliography. Brunn, *Geschichte der griechischen Künstler* (Stuttgart, 1853–59). The earlier works on the paintings of Polygnotus, though of some value, are in general superseded by later investigations, especially those of: Robert, *Die Nekyia des Polygnot* (Halle, 1892); *Die Iliupersis des Polygnot* (ib., 1893); *Die Marathonschlacht in der Poikile und Weiteres über Polygnot* (ib., 1895); Schöne, "Zur Polygnots delphischen Bildern," in *Jahrbuch des archäologischen Instituts* (Berlin, 1893); Schreiber, *Die Wandbilder des Polygnot in Delphi* (Leipzig, 1897); Weizsäcker, *Polygnot's Gemälde in der Lesche der Knidier in Delphi* (Stuttgart, 1895). Consult also Fowler-Wheeler, *A Handbook of Greek Archæology* (New York, 1909), and Franz Winter, in Gercke-Norden, *Einleitung in die Altertumswissenschaft,* vol. ii (2d ed., Leipzig, 1913).

POL'YGON (Lat. *polygonum,* from Gk. πολύγωνον, *polygōnon,* polygon, neut. sing. of πολύγωνος, *polygōnos,* having many angles, from πολύς, *polys,* much, many + γωνία, *gōnia,* angle). If the two end points of a broken line coincide, the figure obtained is called a *polygon,* and the broken line its *perimeter.* The vertices of the angles made by the various segments of the perimeter are called the *vertices* of the polygon, and the segments themselves the *sides* of the polygon. The perimeter of a polygon divides the plane into two parts—one finite (the part inclosed), the other infinite. The finite part is called the surface of the polygon, or for brevity simply the polygon. A polygon is said to be *convex* when no side produced cuts the surface of the polygon, *concave* when a side produced cuts the surface of the polygon, and *cross* when the perimeter crosses itself. The word "polygon," in elementary geometry, is understood to refer to a polygon that is not cross unless the contrary is stated. If all of the sides of a polygon are indefinitely produced, the figure is called a *general* polygon. If a polygon is both equiangular and equilateral, it is said to be *regular.* A polygon is called a triangle, quadrilateral, pentagon, hexagon, heptagon, octagon, nonagon, decagon . . . . dodecagon . . . . pentedecagon . . . . *n*-gon, according as it has 3, 4, 5, 6, 7, 8, 9, 10 . . . . 12 . . . . 15 . . . . *n* sides.


CONVEX.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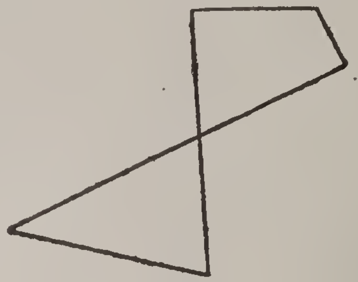
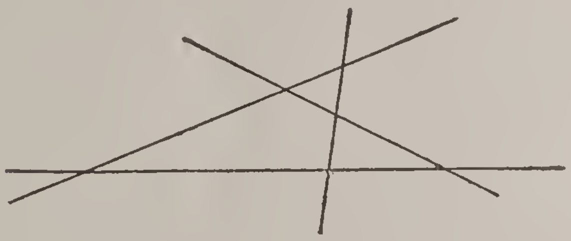
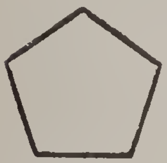
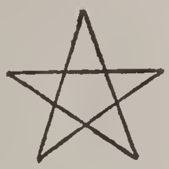
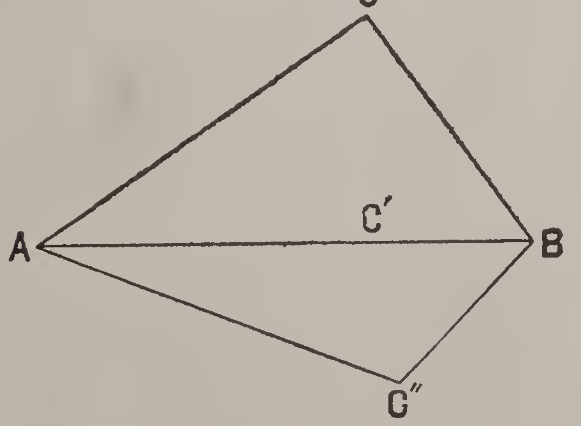

CROSS.


A GENERAL POLYGON (QUADRILATERAL).


REGULAR CONVEX POLYGON.


REGULAR CROSS POLYGON.

According to the principle of continuity (q.v.) polygons may be regarded as positive or as negative. For example, consider the triangle *ABC*, which is, in general, regarded as positive. If *C* moves down to rest on *AB*, then $\triangle ABC'$ becomes zero; and as *C* passes through *AB* $\triangle ABC$ passes through zero and is considered as having changed its sign and become negative; i.e., considered as generated in this manner, $\triangle AC''B$ is negative. In the case of polygons in general the law of signs will readily be understood from the annexed figures. In Figs. 1, 2, 3, both the upper and lower parts of the polygon are considered as positive; in Fig. 4, *P* has reached *BC*, and the upper part of the polygon has become zero; in Fig. 5, *P* has passed through *BC*, and the upper part of the figure has passed through zero and become negative.



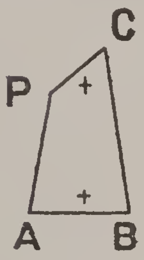


Fig. 1.

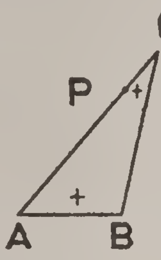


Fig. 2.

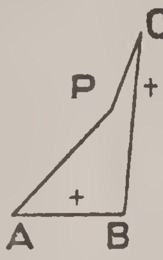


Fig. 3.

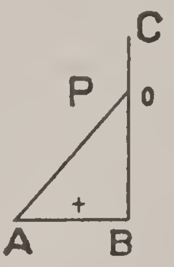


Fig. 4.

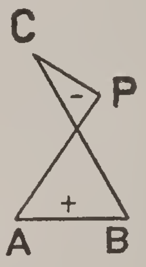


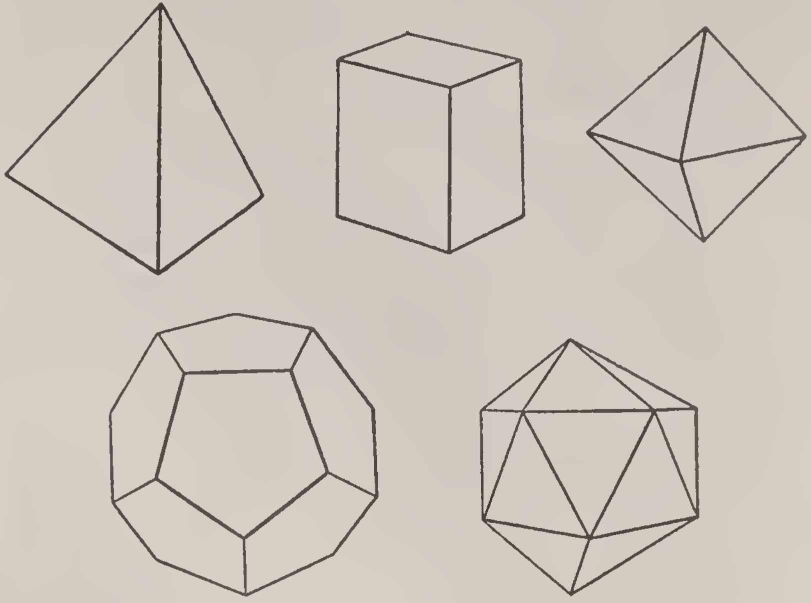
Fig. 5.

The sum of the interior angles of a polygon equals $(n-2)$ straight angles. The sum of the exterior angles equals a perigon, or 360°. In concave polygons certain exterior angles lie inside the polygon and are taken as negative according to the principle of continuity. The number of diagonals of a simple convex polygon is $\frac{n(n-3)}{2}$, n being the number of sides. If a polygon of an even number of sides is circumscribed about a circle, the sums of its even and odd sides are equal; and if a polygon of an even number of sides is inscribed in a circle, the sums of its even and odd angles are equal. The inscription and circumscription of regular polygons depend upon the partition of the perigon. Thus, to inscribe an equilateral triangle in a circle depends upon trisecting the circumference and hence upon trisecting the perigon at the centre. It was known as early as Euclid's time that the perigon could be divided into 2^n, 3.2^n, 5.2^n, 15.2^n equal angles, and no other partitions were deemed possible by the use of the straight edge and compasses. But in 1796 Gauss found, and published the fact in 1801, that a perigon could also be divided into 17.2^n equal angles: furthermore, that it could be divided into $2^m + 1$ equal angles if $2^m + 1$ represents a prime number; and, in general, that it could be divided into a number of equal angles represented by the product of different prime numbers of the form $2^m + 1$. Hence it follows that a perigon can be divided into a number of equal angles represented by the product 2^m and one or more different prime numbers of the form $2^m + 1$. It is shown in the theory of numbers that if $2^m + 1$ is prime, m must equal 2^p; hence the general form for the prime numbers mentioned is $2^{2^p} + 1$. Elementary geometry is thus limited to the inscription and circumscription of the regular polygons mentioned. Consult *Klein's Famous Problems of Elementary Geometry* (Amer. ed., Boston, 1897).

POL′YGONA′CEÆ (Neo-Lat. nom. pl., from Lat. *polygonum*, from Gk. *πολύγονον*, knot grass, polygony, neut. sing. of *πολύγονος*, *polygonos*, prolific, from *πολύς*, *polys*, much, many + *γόνος*, *gonos*, seed), THE BUCKWHEAT FAMILY. A dicotyledonous family of herbs, vines, shrubs, and trees, comprising about 800 species in 40 genera and widely distributed, especially in northern temperate regions. It is a peculiar family, among its associates, in its conspicuously sheathed joints and in its strong tendency to produce three-parted flowers. Representative and familiar genera are as follows. The largest genus is *Eriogonum*, with about 200 species, all of them natives of America and most of them belonging to the western United States. The species of *Rumex*, about 140 in number, are mostly called docks, but one of them (*R. acetosella*) is the sheep sorrel. *Persicaria* (formerly included in *Polygonum*) contains 125 species, called in general smartweeds, but one of them (*P. orientalis*) is the prince's feather, cultivated as an ornamental plant. *Polygonum*, the genus which gives name to the family, contains about 100 species, which are known in general as knotweeds. *Tinaria* (formerly included in *Polygonum*) includes eight species of twiners, known as bindweeds. *Fagopyrum*, with six species, natives of Europe and Asia, is distinguished as including the buckwheat (*F. fagopyrum*); while *Rheum* includes the rhubarb or pieplant (*R. rhaponticum*), a native of the Old World. See Plate of BALSAM, ETC.

POLYG′ONAL NUMBERS. See NUMBER.

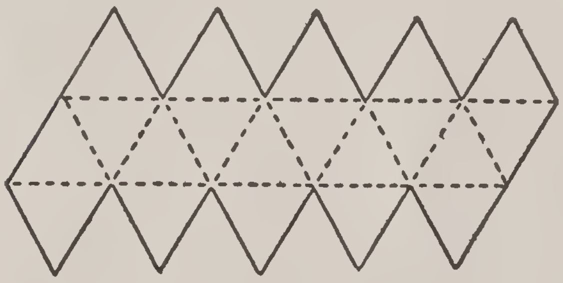
POL′YHE′DRON (from Gk. *πολύεδρος*, *polyedros*, having many bases, from *πολύς*, *polys*, much, many + *ἕδρα*, *hedra*, base). A solid whose bounding surface consists entirely of planes. The polygons that bound it are called its *faces;* the sides of those polygons, its *edges;* and the points where the edges meet, its *vertices.* If a polyhedron is such that no straight line can be drawn to cut its surface more than twice, it is said to be *convex;* otherwise it is said to be *concave.* Unless the contrary is stated, the word "polyhedron" means "convex polyhedron." If the faces of a polyhedron are congruent and regular polygons and the polyhedral angles are all congruent, the polyhedron is said to be *regular.* A polyhedron that has for bases any two polygons in parallel planes and for lateral faces triangles or trapezoids that have one side in common with one base and the opposite vertex or side in common with the other base, is called a *prismatoid.* (See MENSURATION.) In accordance with the definition, all prisms and pyramids (q.v.) are also included among the prismatoids. Among the general relations of polyhedrons the following are the most remarkable: If a convex polyhedron has e edges, v vertices, and f faces, then $e + 2 = f + v$ (a theorem known to Descartes, but bearing Euler's name); e.g., in a regular octahedron, a solid having 8 faces, 6 vertices, and 12 edges, the equation becomes $12 + 2 = 8 + 6$. For every polyhedron there is another which, with the same number of edges, has as many faces as the first has vertices and as many vertices as the first has faces. There cannot be more than five regular convex polyhedrons. These solids are represented by the figures here shown, and are sometimes known as the Platonic bodies, from the attention they received among Platonists. For these five polyhedrons, if s is the number of sides in each face, n the number of plane angles at each vertex, then, following the other notation above given, $sf = n.v = 2c$. Also the sum of all the plane angles in each figure is $2\pi(v - 2)$. These formulas may easily be verified from the following table of elements:



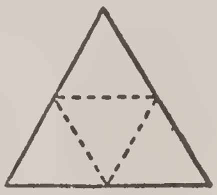
POLYHEDRA.

NAME OF SOLID	s	n	f	v	e
Tetrahedron.....	3	3	4	4	6
Hexahedron......	4	3	6	8	12
Octahedron......	3	4	8	6	12
Dodecahedron....	5	3	12	20	30
Icosahedron......	3	5	20	12	30

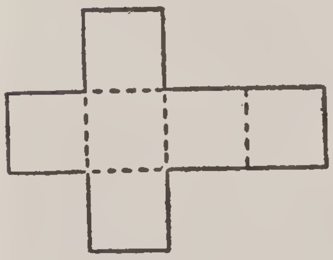
The five regular polyhedrons can be constructed from cardboard by marking out the following, cutting through the heavy lines and half through the dotted ones, bringing the edges together.



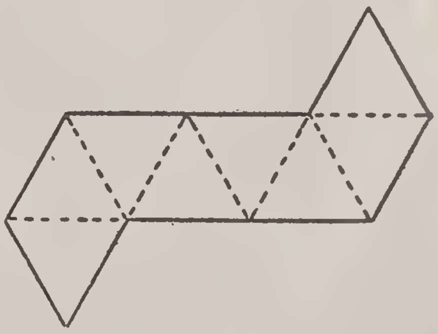
ICOSAHEDRON.



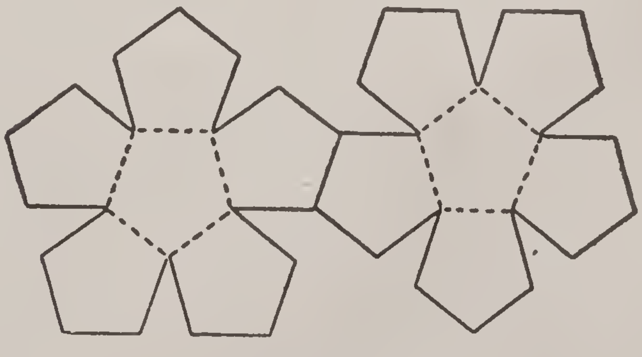
TETRAHEDRON.



HEXAHEDRON.



OCTAHEDRON.



DODECAHEDRON.

Consult: Kirkman, "On the Theory of the Polyedra," in the *Philosophical Transactions of* *the Royal Society*, vol. clii (London, 1862); Zeising, "Die regulären Polyeder," in the *Deutsche Vierteljahrsschrift* (Stuttgart, 1869); Eberhard, *Zur Morphologie der Polyeder* (Leipzig, 1891); Rouché and De Comberousse, *Traité de géométrie* (7th ed., Paris, 1901).

POLYHISTOR, Alexander. See Alexander Polyhistor.

POL'YHYM'NIA, or **POLYMNIA** (Lat., from Gk. Πολυύμνια or Πολύμνια). One of the nine Muses (q.v.). When in late times the functions of the Muses were specialized, she became the Muse of the pantomime and was represented without special attribute, but closely wrapped in her mantle and sometimes with her hand upon her mouth.

POL'YMAS'TODON (Neo-Lat., from Gk. πολύς, *polys*, much, many + μαστός, *mastos*, breast, + ὀδούς, *odous*, tooth). A fossil multituberculate animal of the size of a beaver, of which fragmentary remains have been found in the basal Eocene or Puerco beds of New Mexico. The jaws and dentition have some resemblances to those of rodents.

POLYMESTOR. See Iliona.

POL'YMOR'PHISM (from Gk. πολύς, *polys*, much, many + μορφή, *morphē*, form). The differentiation either of one animal into two or more incomplete undetached individuals (pseudo-individuals) or zoöids, as in the Siphonophores or *Physalia;* or that of the animal into two separate sexes, or of the latter into castes, as in the termites and ants. Instead of the functions of the whole animal or plant being equally distributed to the individual organs, some of the organs or parts of the animal are set apart for this or that function. In the hydra the individual is monomorphic, not divided into male and female individuals, but in *Hydractinia*, a fixed, vegetative form, sexual or reproductive zoöids arise, some female and other male, and also hydra-like or nutritive zoöids or incomplete individuals. In the Portuguese man-of-war (q.v.) we have a still better example of incomplete polymorphism. Thus, as Hertwig states, division of labor leads to greater centralization, "the more polymorphic an animal colony becomes, the more unified it is, the more it gives the impression of being a single animal instead of an aggregation of single animals."

In the hydroids alternation of generations (q.v.) has arisen from a division of labor or polymorphism of individuals originally of equivalent value, in which some individuals (the sexual ones) have separated and acquired a peculiar structure. Moreover, while alternation of generations has arisen from polymorphism, it can again produce it. Hertwig illustrates this by the case of certain medusæ, which, instead of separating, remain permanently attached to the colony. They then degenerate into sporosacs, in which a mouth, tentacles, and a velum are wanting.

A second kind of polymorphism is that seen in the males and the females of most animals. This is sexual dimorphism, which may pass into sexual polymorphism. This is complete polymorphism. Reproduction by budding involves the differentiation of the animal form into three kinds of individuals, i.e., males, females, and neuters, as among insects. Among the cœlenterates and worms the forms reproducing by parthenogenesis (q.v.) are usually larval or immature, as if they were prematurely hurried into existence and their reproductive organs had been elaborated in advance of other systems or organs for the sudden production, so to speak, of large numbers of individuals like themselves.

Among insects dimorphism is intimately connected with organic reproduction. Thus, the summer wingless asexual aphis and the perfect-winged autumnal aphis may be called dimorphic forms. The perfect female may assume two forms, so as to be mistaken for two distinct species.

Dimorphism in Birds. Besides ordinary sexual dimorphism, depending on sex and comprised under the head of secondary sexual characters (see Sex; Sexual Selection), a few special cases are known, due probably to climate or local causes. Thus, in some species of skua a particolored bird may frequently be found mated with a unicolorous form, either male or female. In the guillemots, at nearly every breeding station about 1 in 20 may be marked with a white circle around the eye and a white line extending backward from it, these ringed or bridled guillemots being of either sex and apparently paired with birds of normal plumage, no intermediate forms being known. (See Dichromatism in Birds.) A striking example of dimorphism in respect to the beak is furnished by the huia (q.v.).

Dimorphism and Polymorphism in Insects. Although sexual dimorphism is very prevalent in insects, there are many instances of dimorphism, resulting from local causes, as temperature. (See Temperature Varieties, especially as relating to seasonal dimorphism, wet and dry forms.) Certain species of grasshoppers are dimorphic. In the honey ant (*Myrmecocystus mexicanus*), besides the usual workers, individuals occur with enormous spherical abdomens filled with honey. Here the cause is evidently connected with the food.

The chief initial or determining causes of dimorphism and polymorphism, besides sexual selection (q.v.), are changes in temperature, of light, and of other physical agents. See Evolution.

POL'YMOR'PHOUS, in Mineralogy. See Isomorphism.

POL'YNE'SIA (Neo-Lat., from Gk. πολύς, *polys*, much, many + νῆσος, *nēsos*, island). Dumont d'Urville in 1832 established this designation for so much of the oceanic area of the Pacific as is inhabited by a nearly primitive brown race of obscure Asiatic origin. Based upon a collation of the migration within the area, Polynesia is now divided into the following provinces: Nuclear Polynesia: Samoa, Tonga, Fiji, Niuē, Uvea (Wallis Islands), Futuna (Horne Islands), Tokelau, and Ellice Islands. Central Polynesia: Cook group, Phœnix group, Tubuai group, Rokahanga, Tongarewa, Manahiki. Southeast Polynesia: Society group, Marquesas, Tuamotu, Gambier group, Easter Island, Pitcairn Island, Henderson, Elizabeth, and Ducie islands. Northern Polynesia: Hawaiian Islands, Laysan, Midway, Ocean Island. Southern Polynesia: New Zealand, Chatham Islands; for political convenience this division is attached to Australasia. The Polynesian Verge: certain islands geographically pertinent to Melanesia but ethnically Polynesian—Ticopia, Sikaiana, Liueniua (Ongtong Java), Nukumanu, Tauu, Nuguria, Nukuoro (in Micronesia). In general, the islands of Polynesia are high and volcanic: low islands and atolls are the rule in Central Polynesia, in the southern group of Tonga, and in the Tuamotu. (See individual titles of islands.) Consult: Domeny de Rienzi, *Océanie* (Paris, 1836–55); Mager, *Le monde polynésien* (ib., 1902); general bibliography in *American Geographical Society, Bulletin No. 41* (New York, 1909). See POLYNESIANS.

POLYNE'SIANS. The race of mankind discovered in possession of the islands of Polynesia is among the stateliest of humanity, the men in particular ranking among the tallest, the women being considerably shorter. Their body proportions are comparable to nothing less than the works of the best Greek statuary. Their faces have a distinctly Caucasian cast, a resemblance which would be more complete if it were not for the common practice of flattening the nostrils in children to conform to a local standard of beauty. The skin coloration is of a light olive brown, with a range of pigmentation closely approximating that observed among the Mediterranean peoples of Europe; among the younger women, those who seek shade for cosmetic purposes are several degrees lighter than they become when exposed to the sun in later life; albinism is not infrequent. The hair is long, black, subelliptical in section, and wavy; it was formerly worn at full length by men, cropped to from 2 to 4 inches by women, and clipped in fanciful patterns on young children; since contact with European culture it is cropped short by men and women; it is made brittle and colored red by the frequent application of coral lime, but despite this harsh treatment baldness is rare.

The Polynesians are not indigenous to Polynesia. The study of the early history of the race was hindered by Bopp's erection of a Malayo-Polynesian family (q.v.). It is now possible to trace the race from Polynesia backward through Melanesia into Indonesia and there as far as its western limit at Sumatra, where in the Mentawei Islands is preserved an interesting survival of Polynesians among Malayan people. Earlier than the appearance of the Polynesians in Indonesia it has been found impossible to trace the source of the race with any certainty. Attempts have been made to connect them through the Mon-Khmer with the Indo-Chinese and the Turanian family, with the Caucasian race through the pre-Gangetic Aryans, with the Semitic race of Arabia and the adjacent African highlands. Up to the present their strongly marked anthropometric curves have not been satisfactorily identified among other peoples. The most remote point in their history which may be regarded as definitely established is that the people now Polynesians were established in the Malay Archipelago at the time when the earliest Malayan people advanced from Asia upon those islands, a time which is sufficiently established at about the second century before the beginning of the Christian era.

The advancing Malayans were in possession of metal; the early Polynesians were neolithic and could oppose no successful resistance with stones against bronze and iron. Therefore they took to flight before the wave of Malay culture, were forced eastward through Indonesia and eventually to the Pacific. It has been possible to identify two waves of Polynesian migration within the Pacific—the Proto-Samoan about the Christian era, effecting a lodgment in Nuclear Polynesia, theretofore uninhabited, and the Tongafiti about eight or ten centuries later, with a more advanced culture. It is impossible to identify with any certainty the movement of Tongafiti migration between eastern Indonesia (probably Philippines) and Nuclear Polynesia. Though much earlier, the courses of Proto-Samoan migration have been somewhat exhaustively studied. In examination of the Polynesian Verge and the Polynesian inclusions in Melanesian speech, it has been possible to trace a double track out of Indonesia. One made its exit from Indonesia by way of Torres Strait to the New Hebrides and thence to Fiji. The other passed to the north of New Guinea and into the Pacific by way of the Dampier-Vitiaz passage at the west of New Britain or through St. George's Channel at the east of that island, thence through the Solomon Islands to Samoa. From Nuclear Polynesia the earliest migration eastward was that of Proto-Samoans who fled from the encroachment of the fiercer Tongafiti of their own race. A greater migration movement followed upon the expulsion of the oppressors from Samoa, apparently about the tenth century. The last great migration was that from Central Polynesia to the colonization of New Zealand, in 1350. The distinctly eastward direction of all Polynesian migration is directly due to the fact that it took place in the belt of the southeast trade wind and that the best sailing point of the double canoe is to windward.

The character of the Polynesian measures very high when referred to the standards that represent the sum of the needs of his race; the individual almost always attains to the standard of his race morality. In a juvenile race it is not to be expected that character will stand the test of the higher culture of an older race.

The religion of the Polynesian is partly historical, partly practical. The Proto-Samoans remember the supreme god Tangaloa, maker of heaven and earth, but pay him no act of worship. The Tongafiti have a group of four great gods, Tu, Tane, Lono, and Tangaloa, to whom on occasions of great moment were offered human sacrifices. The common affairs of life were under the charge of family and town gods, ghosts of ancestors and deified animals of a somewhat totemic importance. The chief, as family head, officiated as priest. The practice of religion as a moral code was largely conditioned by the system of the taboo (q.v.).

In the arts the Polynesians remained upon a neolithic plane. They polished stones for utensils and for decorative purposes, the highest pitch being reached by the Maori of New Zealand in the carving of the greenstone, a jadelike nephrite, in the making of axes, lance points, and images of the lesser gods. Wood carving in intricate geometrical figures became an art in the Hervey Islands and the Marquesas. With the sole exception of the Mangarevans they were skilled canoe builders and able navigators. From the bast of trees they manufactured cloth for clothing, from the leaf of the screw pine they plaited mats of wonderful fineness, from the fibre of the hibiscus they made nets, and from the coir of the coconut husk they made ropes of sennit. To pottery, the loom, and the use of the bow they had not attained.

Society was well organized on the base of the family, with an active head chosen by the elders in a system of mixed heredity and adoption. In the historic period the family was patriarchal and polygamous, but there are abundant survivals of matriarchal customs. The system of government is unsurpassed for the hamlet; it breaks down when several hamlets become a district government. With the exception of the *Areoi* of Tahiti there was nothing resembling the secret fraternities of Melanesia, there was no initiation period of boys, and the performance of incision (a modified circumcision) at puberty was not made a ceremony.

The speech of the Polynesians, in which 14 languages exist, as distinct as are the languages of the Romance family, is isolating; it abounds in duplication forms of various structural types, is highly vocalic, and admits of no closed syllables. Though isolating, the words are frequently polysyllabic, the result of the freedom with which unalterable stems may be put together by compaction. The roots are uniformly monosyllabic, either a vowel or a consonant followed by a vowel; in the latter class considerable progress has been made in the reduction of the root to the comprehension of the basic vowel value and the coefficient value of the modulant consonant. These studies occupy an important part in the evolution of human speech from the animal cry. The parts of speech are of the most elemental type and are three in number. The demonstrative expresses position in place or time and carries the germ of the pronoun and the adverbs of place and time. The paradeictic expresses transition, the existence and character of a relation between two concepts; possibly it includes the germ of the substantive verb; it corresponds to the prepositions and conjunctions of the more highly developed categories of grammar. The attributive expresses all names of objects, concepts, states, and acts, therefore embraces the noun, verb, adjective, and adverb, and forms the great mass of the vocabulary. The art of writing had not been discovered, except in the doubtful case of the hyloglyphs of Easter Island (q.v.). Nevertheless a considerable mass of myth and song was preserved in memory, of which a small part has been reduced to writing and preserved for study.

Consult Ellis, *Polynesian Researches* (London, 1853); Grey, *Polynesian Mythology* (ib., 1855); Turner, *Nineteen Years in Polynesia* (ib., 1861); De Quatrefages, *Les Polynésiens et leurs migrations* (Paris, 1866); Meinicke, *Die Inseln des stillen Oceans* (Leipzig, 1875); Gill, *Myths and Songs from the South Pacific* (London, 1876); Fornander, *An account of the Polynesian Race* (ib., 1878–90); Gill, *Historical Sketches of Savage Life in Polynesia* (ib., 1880); Lesson, *Les Polynésiens, leur origine, leurs migrations, leur langage* (Paris, 1880–84); Edge-Partington, *An Album of the Weapons, Tools, Ornaments, Articles of Dress, etc., of the Natives of the Pacific Islands* (Manchester, 1890–98); Ratzel, *History of Mankind* (Eng. trans., London, 1898); S. P. Smith, *Hawaiki, the Original Home of the Maori* (Wellington, 1910); William Churchill, *Polynesian Wanderings*, published by the Carnegie Institution (Washington, 1911); id., *Beach-la-mar* (ib., 1911); id., *Easter Island* (ib., 1912); id., *The Subanu* (ib., 1913); the publications of the Polynesian Society of New Plymouth, New Zealand, and of the Hawaiian Historical Society of Honolulu.

POLYNESIAN SUBREGION. A subregion of the Australian region in zoögeography, embracing all the islands of the Pacific Ocean from Guam on the west to the Marquesas on the east. It is characterized mainly by the absence of indigenous mammals, the great scarcity of reptiles, and the comparative uniformity of its birds. The central and most characteristic fauna seems to be in the New Hebrides. The Hawaiian Islands, although included in the subregion, have so many distinctive peculiarities that some naturalists regard them as a separate subregion.

POLYNICES, pŏl′ĭ-nī′sēz (Lat., from Gk. Πολυνείκης, *Polyneikēs*). A son of Œdipus and brother of Eteocles. See ETEOCLES AND POLYNICES.

POL′YNO′MIAL (from Gk. *πολύς*, *polys*, much, many + Lat. *nomen*, name, thing). A general name for algebraic expressions of more than one term. See ALGEBRA; FUNCTION.

POLYOLBION, pŏl′ĭ-ŏl′bĭ-*a*n. A long descriptive poem by Michael Drayton in 30 parts or songs, published in 1613 and 1622. It is a kind of poetical gazetteer, a description of the rivers, mountains, and forests of England, with histories, traditions, and genealogies, generally so accurate that it was used as an authority by later writers.

POL′YP (Fr. *polype*, from Lat. *polypus*, from Gk. *πολύπους*, *polypous*, polyp, polypus in the nose, many-footed, from *πολύς*, *polys*, much, many + *πούς*, *pous*, foot). A name once given to any of those minute, attached, usually colonial animals having tentacles around the mouth, now recognized either as a special form of cœlenterates (usually some hydroid) or as Polyzoa. The name was given by Réaumur on account of their external resemblance to the many-armed cuttlefishes, which were so denominated by Aristotle; and our knowledge of these organisms as members of the animal kingdom hardly dates from much more than a century ago. Most of them live in colonies, sometimes of great extent, supported on a common stock, to which the term "polypidom" (polyp home) is sometimes given, and which may be horny, gelatinous, or calcareous. The polyps are either embedded in cavities in the substance of the calcareous polypidom or are inclosed in minute cups or tubes in the horny polypidoms, from which the body can be protruded and into which it can be retracted at pleasure. The solitary species often attain a considerable size (as, e.g., many of the sea anemones), but the social polyps are always minute, although the combined power of some of the species in modifying the earth's crust is neither slight nor limited in extent, as is shown by the dimensions and geographical importance of coral. See CORAL; CORAL ISLANDS AND CORAL REEFS.

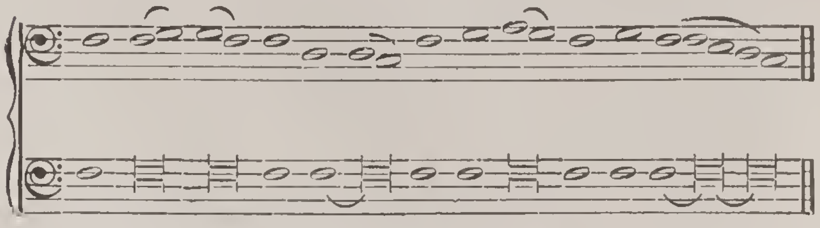
POLYPEPTIDES, pŏl′ĭ-pĕp′tīdz, or **POLYPEPTIDS**, -tĭdz (from Gk. *πολύς*, *polys*, many + *πεπτόν*, *pepton*, neut. of *πεπτός*, *peptos*, cooked). A class of synthetic organic substances resembling the proteins (q.v.). By the action of acidified water upon proteins Emil Fischer succeeded in breaking up these exceedingly complex bodies into simple amino acids, i.e., substances that are at the same time acids and amines (see AMINES), such as aminoacetic acid or glycocoll, $CH_2(NH_2)COOH$. The assumption thus suggested itself that the proteins, whose chemical constitution had long remained an impenetrable mystery, are formed by the combination of a number of simple amino acids, with the elimination of the elements of water. Fischer then proceeded to devise a series of methods for causing amino acids to combine under laboratory conditions, and as the amino acids themselves are mostly synthesizable from the elements, the possibility arose of thus artificially reproducing the proteins, which are so intimately bound up with the phenomena of life in animals and plants. While the simplest natural protein has a molecular weight of about 10,000, the most complex polypeptide yet produced has a molecular weight of only 1213, so that much work must be done before we can achieve the synthesis of a true protein. But already the more complex polypeptides produced show unmistakable resemblance to the natural proteins in their chief chemical and physical properties.

POL'YPET'ALY (from Gk. πολύς, *polys*, many + πέταλον, *petalon*, leaf). A condition in flowers in which the petals are distinct from one another. See FLOWER.

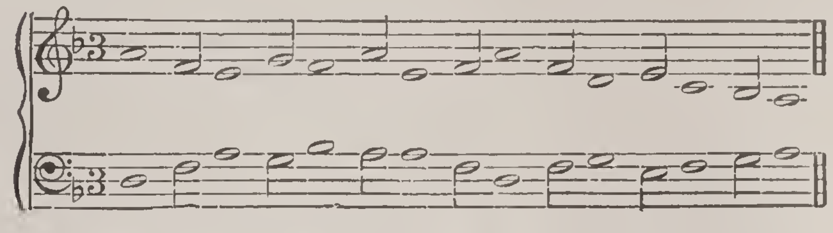
POL'YPHE'MUS (Lat., from Gk. Πολυφῆμος, *Polyphēmos*). In the *Odyssey*, the son of Poseidon and Thoösa, the most celebrated of the fabulous Cyclopes (q.v.), who inhabited the coast of Thrinakia. He was of enormous size and had only one eye. On his return from Troy Odysseus (see ULYSSES) landed in this region, visited the cave of the Cyclops in his absence, and awaited his return. The monster penned the Greeks in his cave and ate two at once. Next morning he devoured two more, but that night, after his evening meal, Odysseus presented him with some strong wine, and, when he had fallen into a drunken sleep, bored out his eye with a blazing ship's mast. They then escaped by clinging beneath the bellies of the sheep that he had penned within the cave (*Odyssey*, ix). It was in answer to the prayer of Polyphemus for vengeance that Poseidon visited Odysseus with so many troubles by sea. The later Alexandrian poetry took up the story of Polyphemus as the giant shepherd and depicted his love for the coy nymph Galatea (q.v.), and the same subject was a favorite with artists of the Roman period. Consult: W. Grimm, *Die Sage von Polyphem* (1857); G. R. Holland, in *Leipziger Studien*, vol. vii (Leipzig, 1884); C. M. Gayley, *The Classic Myths in English Literature and in Art* (2d ed., Boston, 1911).

POLYPHEMUS MOTH. One of the large American silk moths (*Telea polyphemus*), expanding 5 or 6 inches. It is yellowish or brownish, with a window-like spot in each wing, divided by a vein and encircled by yellow and black rings; a dusky band margined with pink lies near the outer margin of both pairs of wings. The caterpillar is light green, with an oblique yellow line on each side of each segment, except the first and the last; it feeds on tree foliage. The cocoon is dense, oval, and is usually inclosed in a leaf. Sometimes it is suspended from a twig, but ordinarily it falls to the ground in the autumn.

POLYPH'ONY (from Gk. πολυφωνία, *polyphōnia*, variety of sounds, from πολύφωνος, *polyphōnos*, having many sounds, from πολύς, *polys*, much, many + φωνή, *phōnē*, sound, voice). In musical composition, the combination in harmonious progressions of two or more parts, each of which has an independent melody of its own. Polyphony is opposed to homophony (q.v.), which consists of a principal part with a leading idea and accessory parts furnishing the harmony. The construction of polyphonic phrases is called counterpoint (q.v.). About the ninth century the beginnings of modern polyphony in organum or diaphony are found; this was the progression of parts in parallel fifths or fourths. In these first attempts at polyphony there are many dissonances which seem to us intolerable; but in the course of time composers learned the secret of obviating the harsh effects by using the intervals in proper succession, and the next step was the combining of two voices into a real harmonic structure. Instead of the melody being only in one voice, as in the following example from Guido d'Arezzo (q.v.),



while the second voice intoned an organ point (q.v.), we have a distinct melody in each voice, as in the following example from the fourteenth century:



When polyphony developed still further, and three and four voices were employed, the additional voices were also given separate melodies as far as possible. Still polyphony as we now understand it had not really begun, for, though the voices were combined in an harmonic whole, they did not all assist in the development of a single idea. Composition had musical but not structural unity. With the rise of the great Flemish school (see MUSIC, HISTORY OF, III) and the appearance of Dufay, Okeghem, Josquin Deprès, Willaert, and their contemporaries, polyphony proper came into existence. Virtually every form of composition was based on a canon (q.v.) or a fugue (q.v.), and the technical dexterity, the mathematical complexity of these early compositions never has been excelled. The reaction was inevitable. With the death of Palestrina (q.v.) in 1594 the decline began. The triumph of monody (q.v.) was swift and widespread, and though it in its turn was supplanted by more complex harmonic forms (see HARMONY), the era of the polyphonic school never has returned. Consult: Humphreys, *The Evolution of Church Music* (London, 1896); R. C. Hope, *Mediæval Music* (ib., 1899); "The Polyphonic Period," in *Oxford Dictionary of Music*, vol. i, edited by W. H. Hadow (Oxford, 1901).

POLYPO'DIUM (Lat., from Gk. πολυπόδιον, sort of fern, from πολύπους, *polypous*, many-footed; so called from the branching rootstock). One of the largest and most widely distributed genera of ferns, containing several hundred species, mainly of tropical and subtropical regions. They are mainly shade species of various habit, and are very commonly epiphytes in the moist tropics. The sori are usually round, without indusium, and are borne variously on the under surface of the leaf, sometimes being terminal on the free veins. As now usually restricted, the genus includes only the forms with free veins, i.e., veins ending freely in the margin of the leaf. *Polypodium vulgare* (polypody), whose fronds grow from 2 to 6 inches or more in length, is one of the most common and widespread species of America and Europe. There are a number of varieties of this species, some of which are extensively grown as ornamentals. The rootstocks of a number of species were formerly employed in medicine, but are now believed to be nearly inert. See Colored Plate of Ferns.

POLYP'ORUS. A fungus attacking old trees and timber. See Amadou; Dry Rot.

POLYPS. See Polyp.

POLYP'TERUS (Neo-Lat., from Gk. πολύπτερος, many-winged, from Gk. πολύς, *polys*, much, many + πτερόν, *pteron*, feather, wing). A genus of ganoid fishes of African rivers. See Bichir; Reed Fish.

POL'YPUS (Lat., from Gk. πολύπους, *polypous*, polypus in the nose, polyp, many-footed). In surgery, a term employed to signify any sort of pedunculated tumor attached to a surface to which it was supposed to adhere like a many-footed animal, as its name indicates. The common seat of polypi is the mucous membrane; hence we have polypi of the nose, ear, bladder, rectum, and uterus. The only satisfactory mode of treatment consists in their removal, which is effected in various ways, as by the forceps, the écraseur, the wire snare, or the ligature.

POLYSARCIA, pŏl'ĭ-sär'shĭ-ȧ. See Obesity.

POL'YSPER'MY. See Embryology.

POL'YTECH'NIC INSTITUTE (from Gk. πολύτεχνος, *polytechnos*, skilled in many arts, from πολύς, *polys*, much, many + τέχνη, *technē*, art). A school of science and liberal arts in Brooklyn, N. Y., established in 1854. It granted its first degrees in arts and sciences in 1871 by special authority of the regents of the State University, and in 1890 was reorganized and received a broad college charter. It now confers the degrees of bachelor of science, master of science, civil, electrical, mechanical engineer, and chemical engineer. During the early years of its history the Polytechnic was known as a successful preparatory school, and it still maintains a preparatory department, as a separate institution, which in 1914–15 had 500 students, while the institute had an attendance of 725, with 85 instructors in all departments. The library contained 15,000 volumes. The president in 1915 was F. W. Atkinson, Ph.D.

POLYTECHNIC SCHOOLS. See Technical Education.

POLYTECHNIQUE, pō'lē'tĕk'nĕk' (*Ecole Polytechnique*). One of the most famous military preparatory institutions of Europe. It was established at Paris by the National Convention as the Ecole Centrale des Travaux Publics in 1794, and in 1795 its name was changed to Ecole Polytechnique. Although intended originally as a preparatory school for all branches of the public service, it was particularly devoted to the training of civil and military engineers. Under the famous mathematicians Lagrange and Monge the institution developed rapidly, especially in mathematics and physical sciences, with a view to their application to technical training. In 1804 Napoleon reorganized it on military lines, and under his régime it became a training school for artillerists and engineers. The Ecole Polytechnique is under the supervision of the Minister of War and is devoted mainly to the preparation of students for the several branches of military and civil engineering. Students must hold the bachelor's degree in order to become eligible for the competitive entrance examination. The course of study covers two years, at the end of which period the names of those who successfully pass the final examination are placed on a list in the order of merit, and candidates are allowed to choose what branch of the service they wish to take up. Soldiers who have been in the service at least six months may be admitted without fulfilling all the ordinary entrance requirements. The branches of the service which rely on the Polytechnique for candidates are the corps of land and naval artillery, military and naval engineers, the marine, the corps of hydrographic, road, bridge, and mining engineers, and the telegraph and gunpowder superintendencies.

POL'YTHE'ISM (from Gk. πολύθεος, *polytheos*, relating to many gods, from πολύς, *polys*, much, many + θεός, *theos*, god). The belief in a multiplicity of deities. (For special phases of polytheism see Animism, Fetishism, Nature Worship, Totemism, as well as articles on Greek Religion; Roman Religion; etc.) The evolution of deities has proceeded from the indifferentiated animism or dynamism of primitive man to the highly complex cosmogonies of the civilized peoples of the ancient world.

In early conditions the development of deities proceeded along the two lines of a specialization and a multiplication of functions of originally but vaguely personal spirits. Thus arose tribal and national deities, who absorbed the powers and functions of minor religious agents, and specialized local deities, who became separated from higher deities of wider power through restriction of functions. As evolution proceeded the personalities of deities tended to become more definite and they assumed distinctly anthropomorphic characteristics. The functions of deities may be derived from three sources: (1) the powers of nature: thus arise gods of the sun and moon, of the stars and the firmament, the dawn, the thunder and lightning, the winds, floods, storms, rivers, and mountains; (2) human attributes: gods are supplied with human qualities, passions, virtues, vices, and desires; (3) human desires: gods are conceived as superhuman, as having that which man lacks—infinite wisdom and foresight, eternal life, colossal strength, transcendent virtue, and exalted capacity for enjoyment.

Even in some of the lower religions the tendency is observable for one deity to assume an exceptional position which ranks above those of the other deities of a given tribe or people. We may assume, although it has never been satisfactorily demonstrated, that out of such multiplicity of deities with one supreme god monotheism has gradually developed through a process of syncretism, the functions and ultimately the very personalities of the inferior deities becoming absorbed in that of the superior god. As against this theory it is held by some students that from the earliest times the superior deity outranked the other deities associated with it to such an extent as to constitute what might be called a limited monotheism.

While the divinities of the Greeks and Romans and of some of the other peoples of antiquity are relatively well known, such is not the case with the lower polytheisms of some of the more advanced among primitive peoples. The animal Olympus of the Zuñi Indians is fairly complex: we learn of divine animals presiding over the various directions, others who control the source of events, still others who hold in their power the success of the hunter. The Koriak believe in a Supreme Being, who is variously known as the Universe, or the Supervisor, or Existence, or The-One-on-High, or Dawn, or Sun. The wife of the Supreme Being is Supervisor Woman, also known as Sea Woman. The children of the couple are Cloud Man, or Cloud Maker, and Cloud Woman. While the Supreme Being and his family are beneficent deities, man is constantly threatened by the machinations of a host of malevolent beings, the Kalan. According to Koriak ideas the Kalan live in families, like human beings, with an old man at the head of the family, his children, their wives, etc. Big Raven, one of the beneficent deities, and his children wage a constant war against the Kalan. The Haida of the Queen Charlotte Islands believe that their country rests on a great supernatural being called Sacred-One-Standing-and-Moving. The highest of Haida deities, however, is Power-of-the-Shining-Heavens, which seems to be associated with the sky. A house suspended in the air is the abode of Faxet, to whom go all who die a violent death. Another suspended house is occupied by the Above-People, who are not longer than one's hand and wrist. The sea and rivers swarm with supernatural beings. All animals, whether of land or sea, have their spiritual prototypes, who are powerful divinities. Such are the Black-Whale-People, the Herring-People, the Killer-Whales, the Salmon-People, etc. The most important of land beings are the Creek Women, otherwise called Daughters-of-the-River. The land animals also have their divine spiritual guardians, the Grisly-Bear-People, Black-Bear-People, Land-Otter-People, Eagle-People, etc. Among the deities associated with economic life and the industries, prominent place is occupied by Property Woman, Master Carpenter, and Master Canoe Builder.

It will thus be seen that polytheism, comprising a multiplicity of more or less differentiated personal deities, is by no means peculiar to the higher stages of religion. It occurs, on the contrary, among peoples of relatively low culture, in association with a general animism, fetishism, totemism, and other forms of belief.

For bibliography, consult special articles referred to above.

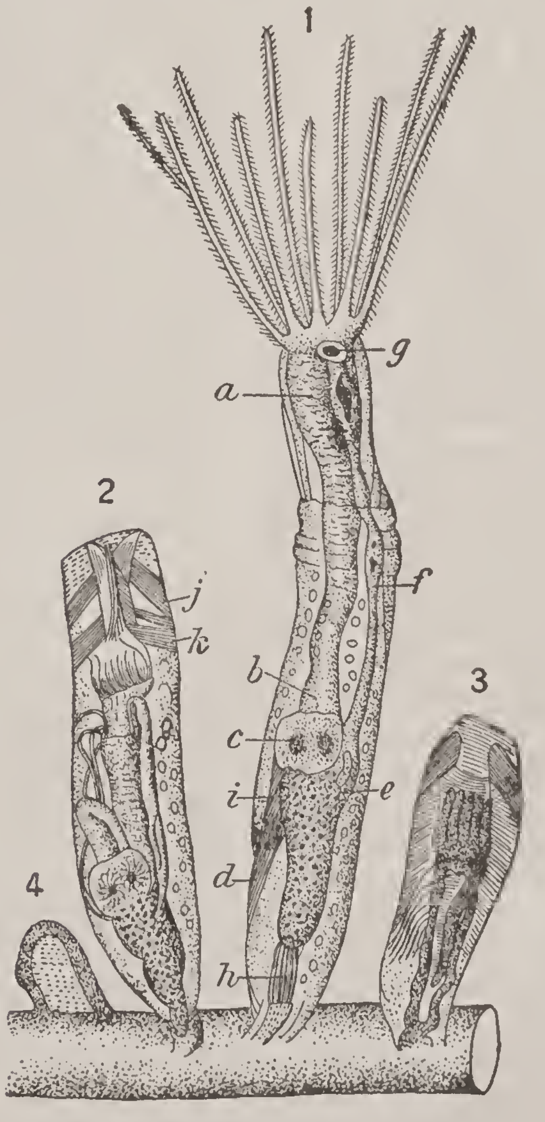
POL'YTRICHID'IUM. A bryophyte (q.v.). See Plate of Musci.

POL'YU'RIA. An excessive secretion of urine, temporary or permanent. The urine is increased after excessive drinking of fluids, exposure to cold, the suppression of perspiration, the taking of certain drugs called diuretics (q.v.), and as a sequel of hysterical attacks. An increase in the amount of urine is a favorable sign during defervescence in acute febrile diseases, and attends certain organic diseases of the nervous system, e.g., cerebellar, bulbar, and spinal tumors, locomotor ataxia, and meningitis. Permanent polyuria is characteristic of diabetes mellitus and diabetes insipidus, of chronic interstitial nephritis, and of amyloid disease of the kidneys. See Diabetes.

POLYX'ENA (Lat., from Gk. Πολυξένη). The daughter of Priam and Hecuba. She was betrothed to Achilles (q.v.), who, according to one story, was killed by Paris (q.v.) while celebrating his nuptials with her in a temple of Apollo. At the demand of his shade Polyxena was sacrificed in expiation on his funeral pyre. Her death forms the subject of the first part of Euripides' *Hecuba*.

POL'YZO'A (Neo-Lat. nom. pl., from Gk. πολύς, *polys*, much, many + ζῷον, *zōon*, animal), or Moss Animals. Minute marine animals usually forming mosslike or coral-like calcareous or chitinous masses called corms, each cell containing a polyp-like animal with the digestive tract flexed, the anus situated near the mouth. The body is usually drawn in and out of the cell by the action of retractor and adductor muscles. The mouth is surrounded by a crown of long tentacles. No heart or vascular system exists, and the nervous system consists of a single or double ganglion situated between the mouth and the vent, with nerves proceeding from it. The Polyzoa are hermaphroditic, multiplying by budding or eggs. The embryo passes through a blastula, gastrula, and trochosphere stage, the corm being formed by the budding of numerous cells from a primitive one. The group was formerly called Bryozoa.

Fossil Polyzoa are common in nearly all geological formations from the Ordovician upward. Because of the difficulties attendant upon their identification, very few of them have served as horizon markers or index fossils. The one prominent exception to this rule is the genus *Archimedes*, with its screw-shaped axis, which is very abundant in some parts of the Carboniferous rocks. In North America the Trenton, Cincinnati, and Hamilton groups are especially prolific sources of supply. The European Mesozoic and Tertiary deposits abound in them, one author, D'Orbigny, having described about 850 species from the Upper Cretaceous beds alone, while the rocks of these ages in North America are comparatively lacking in them. The North American Paleozoic has afforded about 1325 species, distributed under 170 genera. Consult: Von Zittel and Eastman, *Textbook of Paleon-*



A TYPICAL POLYZOAN.

1, animal of *Bowerbankia densa* fully expanded: *a*, pharynx; *b*, cardia; *c*, gizzard; *d*, stomach; *e*, pylorus; *f*, intestine; *g*, anus; *h*, muscles. 2, the same animal when completely retracted: *j*, *k*, opercular retractor muscles. 3, an immature animal. 4, a bud in its earliest state.

tology, vol. i (New York, 1900); Nickles and Bassler, "Synopsis of American Fossil Bryozoa, Including Bibliography and Synonymy," in *United States Geological Survey, Bulletin No. 173* (Washington, 1900); S. F. Harmer, "Polyzoa," in *Cambridge Natural History*, vol. ii (New York, 1901).

POMACE (pŭm′ȧs) **FLY** (ML. *pomacium*, cider, from Lat. *pomum*, apple, pome). One of the small yellowish flies of the genus *Drosophila*, very common about the refuse of cider mills and fermenting vats of grape pomace; also in houses, about overripe or decaying fruit, in which they lay their eggs. The larvæ breed occasionally in decaying animal matter also, and in excrementitious matter, and these flies are undoubtedly instrumental in spreading disease by frequenting the dining rooms of unscreened houses.

POMARE, pȯ-mä′rȧ. The name of four sovereigns of the Society Islands, of whom Pomare IV, Queen of Tahiti (1813–77), is best known. During her reign France seized the islands in 1842, established a protectorate, and in 1880 annexed them. A revolution in 1852 forced Queen Pomare to abdicate in favor of her children. See SOCIETY ISLANDS; TAHITI.

POMBAL, pôɴ′bȧl′, SEBASTIÃO JOSÉ DE CARVALHO E MELLO, MARQUIS OF (1699–1782). A Portuguese diplomat and statesman, known to his countrymen as the Great Marquis. He was born May 13, 1699, at the castle of Soure, near Pomba. After studying law at Coimbra and serving a short time in the army, Pombal received an appointment in the service of the Portuguese government. In 1739 he was appointed Envoy Extraordinary to the Court of London through the influence of his uncle, Paulo Carvalho, and held the appointment six years, after which he was sent to Vienna in a similar capacity. He there married Countess Daun, and on returning to Lisbon, in 1750, he became popular with the Austrian party in the Portuguese court and was appointed Minister of Foreign Affairs by King Joseph. His activity was not confined to the external concerns of the realm. His first acts were to limit the power of the Inquisition and also to reattach to the crown a great number of domains that had been unjustly alienated. Then followed the reorganization of the army, the introduction of fresh colonists in the Portuguese settlements, and the establishment of an East India company and a Brazilian company. He introduced into Brazil the cultivation of coffee, sugar, cotton, rice, indigo, and cacao, and freed the Indians from slavery. When the great earthquake of 1755 laid Lisbon waste, Pombal displayed surpassing courage and energy in bringing about the rebuilding of a greater and more beautiful capital. The King raised him to the rank of Count D'Oeyras, and in the following year appointed him Prime Minister. He crushed an alleged conspiracy instigated, so he asserted, by the great nobles and the Jesuits, the latter of whom he expelled from court and in 1757 confined to their colleges. An attempt upon the life of the King, to which the Jesuits were accused of being a party, but which some historians assert was a complot of Pombal himself to serve his own political ends, placed his enemies completely in his power. The leaders were severely punished by command of the Minister. Pombal made up his mind that the presence of the Jesuits in Portugal was incompatible with the security of the government and the welfare of the nation, and by a royal decree of Sept. 3, 1759, they were banished from the Kingdom as rebels and enemies to the King. Pombal had them seized and carried on board ships and transported to the states of the Church. The Pope, Clement XIII, protested vehemently, whereupon Pombal caused the Papal Nuncio to be shown across the frontier. He also expelled the Jesuits from the famous missions in Paraguay, which resulted in their complete destruction. All this time Pombal was laboring energetically to improve agriculture in Portugal and also the system of primary education. In 1770 he was created Marquis of Pombal, and from this period to the death of the King in 1777 he was at the very height of his power. The accession of Joseph's daughter, Maria I, brought about his downfall. He was deprived of his office; the numerous alleged conspirators whom he kept in prison were released; many of his measures were abrogated, and Maria ordered him to retire to his castle of Pombal. He died there May 8, 1782.

Bibliography. George Moore, *Lives of . . . Alberoni, . . . Ripperda, and . . . Pombal* (London, 1814); J. Smith, Count of Carnota, *Memoirs of the Marquess of Pombal* (ib., 1843); Oppermann, *Pombal und die Jesuiten* (Hanover, 1845); *Prisons du marquis de Pombal . . . 1759–1777: Journal*, edited by A. Carayon (Paris, 1865); F. L. Gomes, *Le marquis de Pombal: Esquisse de sa vie publique* (ib., 1865); Weld, *The Suppression of the Society of Jesus in the Portuguese Dominions* (ib., 1877); C. J. de Menezes, *Os Jesuitas eo marques de Pombal* (Oporto, 1893).

POME (OF. *pome*, *pomme*, Fr. *pomme*, apple, from Lat. *pomum*, fruit). A fruit in which the flesh is developed from the cuplike structure upon which the sepals, petals, and stamens have stood in the flower. Apples, pears, and quinces are illustrations. The core, with its contained seeds, is the transformed ovary, which is closely invested by the fleshy covering. See FRUIT.

POMEGRANATE, pom-grăn′ȧt (OF. *pome granate*, from ML. *pomum granatum*, apple with seeds, from Lat. *pomum*, apple pome, and *grana-*

POMEGRANATE FRUIT AND FLOWER.

tus, having seeds, from *granum*, seed, grain), *Punica granatum*. A thorny shrub or small tree of the family Punicaceæ, native of southwest Asia, naturalized in southern Europe, and widely cultivated during historic time. The cultivated varieties, which are scarcely thorny, have coral-red, waxlike terminal flowers, leathery-skinned fruits as large as oranges, yellow, with a rosy cheek. Each of the many seeds is enveloped in a sweet or subacid separate pulp inclosed by a thin membrane. This pulp is often used for the preparation of cooling drinks. A kind of pomegranate without seeds is cultivated and much prized in India and in Persia. There are ornamental varieties with double flowers. The finest morocco leather is said to be tanned with the rind of the fruit. In the United States the cultivation of the pomegranate is confined to the southern part of Florida and the warmer parts of California and Texas, since the tree is tender, being injured by a temperature of 8° to 10° below freezing. In some portions of the South the plant is used for hedges, in which form it grows through a much wider latitude. It is propagated by cuttings of both green and ripe wood, by layers, and by grafting.

POMEGRANATE. See MUSKMELON.

POM′ELO. See GRAPEFRUIT.

PO′MERA′NIA (Ger. **POMMERN**, pŏm′-mĕrn). A province of Prussia, bounded by the Baltic Sea on the north, West Prussia on the east, Brandenburg and West Prussia on the south, and Mecklenburg-Schwerin on the west; it also touches Mecklenburg-Strelitz (Map: Germany, F 2). Its area is 11,634 square miles. The surface is mostly flat, with isolated hills in the eastern part and a general inclination towards the Baltic. The coast is low and is very deeply indented, forming numerous inlets, among which the Stettiner Haff is the most prominent. The only river of importance is the Oder. There are numerous lakes both along the coasts and in the interior. The climate, especially in the east, is somewhat raw. Pomerania is chiefly an agricultural country, although its soil with a few exceptions is rather inferior and in some parts is unfit for farming. Rye, oats, wheat, barley, potatoes, tobacco, and several kinds of beets are raised. In 1913 there were under rye 466,808 hectares; oats, 310,279; potatoes, 219,572; wheat, 60,394; barley, 56,348. The number of horses in 1913 was about 242,500; cattle, 858,200; sheep, 711,200; goats, 87,300; swine, 1,326,700. Some of these products are exported. Smoked fish is one of the famous products of Pomerania. The manufacturing industries are of less importance. They are centred chiefly in the cities and are confined for the most part to shipbuilding and the manufacture of machinery. There are also some glassworks, sugar refineries, tobacco factories, woolen mills, breweries, and distilleries. Owing to its numerous harbors Pomerania has a well-developed sea trade, of which Stettin, the capital, is the centre. The province is divided into the three districts of Stettin, Köslin, and Stralsund, and sends 26 Deputies to the Lower and 25 to the Upper House of the Prussian Landtag. The increase in population has been much below the average for the Empire. In 1871 the inhabitants numbered 1,431,633; in 1880, 1,540,034; in 1890, 1,520,889; in 1900, 1,634,832; in 1910, 1,716,921. The Poles and other Slavs number about 15,000. The only large city is Stettin (pop., 237,419).

History. The Vandals, who occupied the country at the beginning of historic times, were succeeded in the fifth and sixth centuries by the Slavic Wends, who before the end of the twelfth century had been converted to Christianity. Under the Wends the country was divided into several principalities. Two of the princes assumed the ducal title in 1170. In 1181 they were recognized as dukes of the Empire by Frederick Barbarossa, and soon after the Margrave of Brandenburg received the feudal suzerainty over Pomerania. In 1308 the district between the Persante and the Vistula, known as Pomerellen, was ceded to the Teutonic Order, but territorial gains were made on the west. Subsequently the Elector of Brandenburg received the right of succession to the Pomeranian lands upon the extinction of the ruling house in the male line. In 1541 the duchies of Stettin and Wolgast were erected, to which were frequently given the names of Hither Pomerania and Farther Pomerania respectively. The line of Slavic dukes died out in 1637, but in the Treaty of Westphalia, in 1648, Brandenburg had to content herself with the greater part of Farther Pomerania, Hither Pomerania and some districts of Farther Pomerania going to Sweden. The Prussian possessions in Pomerania were rounded out by the Treaty of Stockholm in 1720, when Sweden relinquished part of Hither Pomerania, and in 1815 Prussia acquired the rest of Swedish Pomerania.

POMERANIAN DOG. See SHEEP DOG.

POMERANUS, pŏm′ĕr-ā′nŭs *or* pō′mĕ-rä′nụs. See BUGENHAGEN, JOHANN.

POMERENE, ATLEE (1863–). An American legislator. He was born at Berlin, Holmes Co., Ohio, graduated from Princeton in 1884 and from the Cincinnati Law School in 1886, and thereafter practiced law at Canton, Ohio, where he was city solicitor in 1887–91. He served as prosecuting attorney of Stark Co., Ohio, from 1897 to 1900, was appointed a member of the Honorary Tax Commission of Ohio in 1906, and became Lieutenant Governor of Ohio in 1910. In the latter year Pomerene presided over the Democratic State Convention and was elected United States Senator for the term 1911–17.

POMERIUM. See POMŒRIUM.

POMEROY, pŏm′e-roi. A village and the county seat of Meigs Co., Ohio, 125 miles by rail southeast of Columbus, on the Ohio River and on the Hocking Valley and the Kanawha and Michigan railroads (Map: Ohio, F 7). It is in a region possessing valuable deposits of salt and bituminous coal and is of commercial and industrial importance. It is particularly noted for the production of calcium and bromine. The salt works are extensive. There are, besides, foundries and machine shops, flour and lumber mills, etc. A Carnegie library is maintained by the village. The government is administered by a mayor, elected biennially, and a unicameral council. Pomeroy was settled in 1816 and was first incorporated in 1840. Pop., 1900, 4639; 1910, 4023.

POMEROY, FREDERICK WILLIAM (?–). A British sculptor. He studied at the Lambeth art schools, at the Royal Academy schools, and in Paris. He did much to popularize decorative sculpture. Pomeroy did the carvings and metal work for Welbeck Abbey and the stone panels and frieze for the Sheffield town hall and is noted for his statues: Robert Burns (Paisley and Sydney, New South Wales), Gladstone

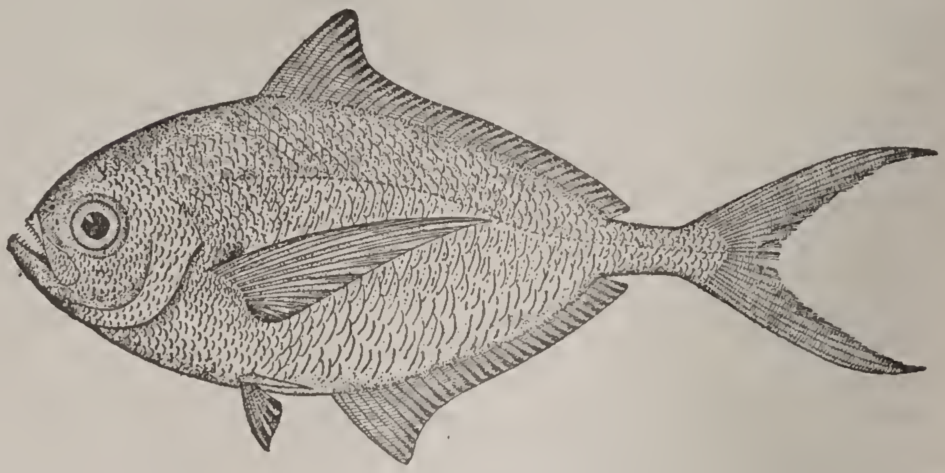
(Houses of Parliament), Duke of Westminster (Chester Cathedral), Archbishop Temple (Canterbury Cathedral), and Lord Dufferin (Belfast). Productions of another type include "Dionysos" and "The Nymph of Loch Awe" (Tate Gallery), "Giotto," and "Perseus." Pomeroy's work shows careful technique, imagination, and strength. He was elected an associate of the Royal Academy in 1906.

POMEROY, John Norton (1828–85). An American lawyer and legal writer, born in Rochester, N. Y. He graduated at Hamilton College in 1847 and was admitted to the State bar in 1851. He then practiced law in Rochester until 1864 and from 1864 to 1868 was professor of law and political science and dean of the law faculty of the University of New York. From 1869 until 1878 he again practiced law in Rochester and from 1878 until 1885 was professor of municipal law in the University of California. He edited Sedgwick's *Statutory and Constitutional Law* (1874) and Archbold's *Criminal Law* (1876), and wrote *An Introduction to Municipal Law* (1865); *An Introduction to the Constitutional Law of the United States* (1868; 9th ed., 1886); *Remedies and Remedial Rights According to the Reformed American Procedure* (1876); *A Treatise on Riparian Rights* (1884); *A Treatise on Equity Jurisprudence* (3d ed., 4 vols., 1905).

POMEROY, Seth (1706–77). An American soldier, born in Northampton, Mass. He early became a blacksmith and accumulated property, but was interested chiefly in military affairs. He was major of the Fourth Massachusetts Regiment in the successful attack upon Louisburg in 1745 and the next year was engaged against the Indians on the frontier. In the French and Indian War he was lieutenant colonel in the expedition against Crown Point. When Col. Ephraim Williams was killed at Lake George, Sept. 8, 1755, Pomeroy took command of the regiment and captured the French commander, Baron Dieskau. Promoted colonel in 1757, he marched to the relief of Fort William Henry, and in 1760 he commanded the frontier forts. He was elected to the first New York Provincial Congress in 1774 and was one of the three men put in charge of the military forces of the Colony by that body. In 1775 he was again a member of the Provincial Congress, drilled the militia, and is said to have planned the capture of Fort Ticonderoga. In the battle of Bunker Hill Pomeroy fought at first as a private, but during a part of the day commanded a battalion. On June 22 he was nominated to be one of the first eight brigadiers named by Congress, but on account of his advanced age declined to accept larger responsibility. In the latter part of 1776, at Washington's personal solicitation, he joined General McDougal at Peekskill, but died of pleurisy, Feb. 17, 1777, before seeing any active service. His journal, published in J. R. Trumbull's *History of Northampton* (2 vols., Northampton, 1902), contains much interesting matter concerning the colonial wars.

POM'FRET. A town in England. See Pontefract.

POMFRET (probably corrupted from Portug. *pombo, pampo,* pomfret). The name in Bermuda of a fish (*Brama raii*) allied to the moonfish and the harvest fish, but representing a singular family whose three or four species are of almost cosmopolitan distribution. West Indian local names are castagnole and rondanin. They are large dun-colored pelagic fishes, which roam widely, descend to great depths, and are edible. The young differ decidedly from the adults. Consult Jordan and Evermann, *Fishes of North and Middle America* (Washington, 1898).



THE POMFRET (*Brama raii*).

POMFRET, John (1667–1702). An English poet, born at Luton, Bedfordshire; was educated at Queens' College, Cambridge, and was rector of Maulden and then of Millbrook, both in Bedfordshire. His poem *The Choice* (1700), written in the heroic couplet, was admired by Dr. Johnson; his *Miscellany Poems* appeared in 1702. Consult Samuel Johnson, *Lives of the British Poets,* vol. i (London, 1779; new ed., Oxford, 1905).

POM'MER, Dr. See Bugenhagen, Johann.

POMMERN, pôm'ĕrn. See Pomerania.

PO'MO (probably, earth people, indigenes). A group of small tribes constituting a distinct linguistic stock known as the Kulanapan, formerly dwelling in northwestern California. When first described by Gibbs, in 1853, they were very numerous, with villages along every stream, but they are now nearly extinct. They were described in 1876 by Powers, in his *Tribes of California,* as a peaceful, good-tempered, and easy-going people, rather below the intellectual standard of their more warlike neighbors. They built conical dwellings of poles and bark for their winter residence, with brush shelters in the summer. They had a system of dual chieftainship, with rather elaborate marriage ceremonies, and usually burned their dead. A secret society of the Pomo had branches in nearly every village; its members, in horrible disguise, at frequent intervals made the rounds of the dwellings to terrorize the women by their uncouth appearance and antics, the belief being that for the time being the performers were incarnations of the tribal demons. Like most of the northern California tribes, they had a thanksgiving dance after an abundant acorn crop. Their fame rests chiefly upon the baskets woven by their women. Almost all their household utensils were of basketwork, and the art survives in almost its old-time perfection, now highly prized by collectors and museums. (See Basket.) The following tribes survive: Clear Lake, Gynomehro, Little Lake, Lower Lake, and Pomo. Consult: O. T. Mason, *Aboriginal Indian Basketry* (Washington, 1904); S. A. Barrett, *Pomo Indian Basketry* (Berkeley, Cal., 1908); id., *Ethnogeography of Pomo and Neighboring Indians* (ib., 1908).

POMŒ'RIUM, or **POME'RIUM** (Lat., commonly explained as the space behind the wall, from *post*, after, behind + *murus*, *mœrus*, wall; but R. G. Kent, "The Etymological Meaning of Pomerium," in *Transactions of the American Philological Association*, xliv, Boston, 1914, explains it rather as corrupted from *proimoiriom*, from *pro*, before, i.e., outside, and *mœrus*, wall). A space about (or outside) the walls of ancient Rome, marked off by cippi (or boundary stones) and kept vacant as sacred ground. The pomœrium marked the limits of the city. It was advanced by Sulla, and later by several of the emperors, when the bounds of the Empire were enlarged. Consult the references in the footnotes of Kent's article, referred to above, and the article "Pomerium," in Friedrich Lübker, *Reallexikon des klassischen Altertums*, vol. ii (8th ed., Leipzig, 1914).

POMOL′OGY (from Lat. *pomum*, apple, pome + Gk. -λογία, *-logia*, account, from λέγειν, *legein*, to say). The study or cultivation of fruits, particularly those belonging to the apple family. This restricted meaning is not now adhered to, and the term is often used synonymously with fruit culture in general and is made to include all fruits. See Fruit, Cultivated; Horticulture.

POMO′NA (Lat.; connected with *pomum*, apple, pome). An ancient Latin or Italian goddess of fruit, especially of gardens. Her early prominence is shown by the existence of a *flamen Pomonalis*, at the foot of the list of *flamines* (see Flamens), and the presence of a sacred grove, the Pomonal, near the road to Ostia. It is, however, still doubtful whether these indications speak for a Pomona or a Pomonus, as a god of that name is found among the Umbrians, or possibly for a pair of divinities, such as is not uncommon in the early Roman religion. In the later Roman poets, especially Ovid, Pomona appears in various legends. Thus she is the wife of the mythical King and prophet, Picus (q.v.), who was changed by the jealous Circe to a woodpecker. More famous is Ovid's tale (*Metamorphoses*, xiv, 623 ff.) of the fair but cold nymph Pomona, who, absorbed in the care of her trees, disdained all other love, till Vertumnus, the "transformer" who ripens the fruits, after vainly wooing her in many forms, finally approached her as an old woman, who won her favor and told her many stories of the fate of those who had despised love. Even then she remained indifferent to the suit of Vertumnus till the god assumed the form of a youth of perfect beauty, when she yielded, and from that time the lovers were inseparable. Consult Georg Wissowa, *Religion und Kultus der Römer* (2d ed., Munich, 1912).

POMONA, or Mainland. The largest of the Orkney Islands (q.v.).

POMONA. A city in Los Angeles Co., Cal., 33 miles by rail east of Los Angeles, on the Southern Pacific and the San Pedro, Los Angeles, and Salt Lake railroads (Map: California, H 8). It is a beautiful town, situated in the San Gabriel valley, attractive as a place of residence and as a health resort, and noted also as the centre of extensive fruit-growing interests, especially the culture of oranges. At Claremont, in the vicinity, is Pomona College (Congregational), opened in 1888. Ganesha Park commands a magnificent view of the country and also of the sea, about 50 miles distant. There is a public library. Pomona was settled in 1875 and incorporated in 1887. Pop., 1900, 5526; 1910, 10,207; 1914 (U. S. est.), 12,202.

POMONA COLLEGE. A coeducational institution for higher education at Claremont, Cal., founded in 1887 under Congregational auspices, but free from ecclesiastical control. The campus comprises more than 100 acres. A plan for the development of the campus and buildings has been carefully worked out by competent landscape architects, and all growth is in accordance with this harmonious plan. The total enrollment in all departments in 1915 was 541; of these all but 21 were in four college classes. The freshman class is limited to 100 men and 100 women. The instructors numbered 45. All courses given in the college lead to the degree of B.A. The college has an endowment of approximately $1,000,000. The value of the grounds and buildings is about $580,000, and the annual income $125,000. In 1915 the Mabel Shaw Bridges Hall of Music, one of the finest music halls on the coast, was completed. The library contains about 22,000 volumes. The president in 1915 was James Arnold Blaisdell, D.D.

POMO′NUS. See Pomona.

POMPADOUR, pôɴ′pȧ′dōōr′, Jeanne Antoinette Poisson, Marquise de (1721–64). A mistress of Louis XV of France. She was born in Paris, Dec. 29, 1721, of obscure parents, bearing the name of Poisson. Lenormant de Tournehem, a rich farmer-general, was supposed to be her father, however, and he saw that she was well educated and well provided for. She excelled in music, elocution, and drawing; but what charmed the brilliant society that frequented the salons of the rich financier was the perfect grace and beauty of her figure and the exquisite art with which she was dressed. A crowd of suitors sought her in marriage, but in 1741 she became the wife of De Tournehem's nephew, Lenormant d'Etioles. In 1745 Madam d'Etioles, who had attracted the favorable notice of the King, was installed in the palace of Versailles. Soon after this time she was ennobled by the title of Marquise de Pompadour and long ruled the King, first as mistress and afterward as an indispensable purveyor of diversions. The King believed her extremely clever, and after he had lost his first passion for her as his mistress was glad to avail himself of her services as his chief political adviser. In fact, for nearly 20 years her influence was predominant in all important affairs of state. The choice of ministers, of ambassadors, of generals, depended on "la Pompadour" and her favorite minions. The Austrian Prime Minister, Kaunitz, even induced Maria Theresa to sacrifice her pride to the exigencies of her position, and the Empress wrote the royal mistress a letter in which she addressed her as *ma cousine*. Largely through the influence of the Marquise de Pompadour was that diplomatic revolution effected which in the Seven Years' War ranged France on the side of her hereditary enemy, Austria. (See Kaunitz.) She made and unmade ministers, and Choiseul-Amboise (q.v.) owed his influence to her support. She was a bitter enemy of the Jesuits and was responsible to a great degree for their expulsion from France. She was noted also for her patronage of artists and literary men. She was in receipt of an income of 1,500,000 francs a year and had apartments at Paris, Versailles, and Fontainebleau. She died at Versailles, April 15, 1764.

Bibliography. Goncourt, *Madame de Pompadour* (Paris, 1887); Pavlovski, *La marquise de*

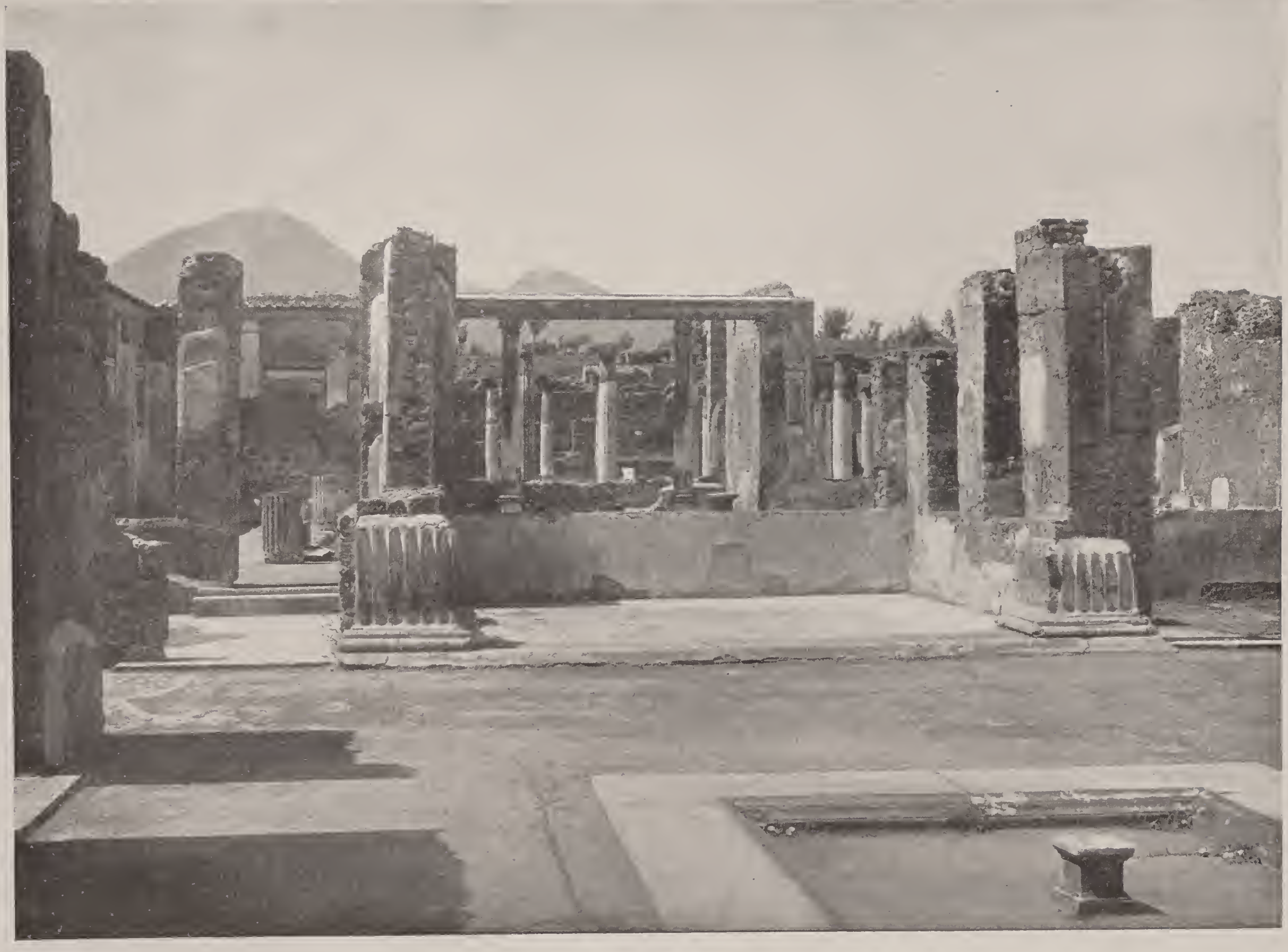
Pompadour (ib., 1888); Dietrick, *Les maîtresses de Louis XV* (Vienna, 1881); Sainte-Beuve, *Causeries du lundi*, vol. xi; Fleury, *Louis XV intime* (Paris, 1899); De Caraman, *La famille de la marquise de Pompadour* (ib., 1900); also her *Correspondanee*, edited by Malassis (ib., 1878). Two volumes of alleged *Mémoires* of the Marquise de Pompadour are without value. Consult, however, the *Mémoires de Madame du Hausset, femme de chambre de Madame de Pompadour* (Paris, 1846); Capefigue, *Madame de Pompadour* (ib., 1858); Campardon, *Madame de Pompadour et la cour de Louis XV* (ib., 1897); N. Williams, *Madame de Pompadour* (London, 1902); De Nolhac, *Louis XV et Madame de Pompadour* (Paris, 1903).

POM'PANO (Sp. *pampano*, young vine tendril), or PALOMETA. A fish of southern waters, representing a section of the great horse-mackerel family Carangidæ, and of admirable edible quality. The "common" pompano (*Trachynotus carolinus*) dwells along the South Atlantic and Gulf shores of the United States and southward and is occasionally seen on the Pacific coast. It has the characteristic ovate form of the group (see Plate of HORSE MACKERELS AND ALLIES), is bluish and silvery in colors, and is about 18 inches long. This pompano is found all the year round at the Florida Keys and south of that, but northward enters the bays in large schools in the spring. These disperse to the feeding and spawning grounds in shallow inlets and gather again in the autumn for migration. This fish is caught in seines and otherwise both in spring and autumn, but is fattest and best in the latter season.

Several other species exist, some of which are valuable. The largest, the "great" pompano or "permit" (*Trachynotus goodei*) of the West Indian region, reaches a length of 3 feet; it is closely allied to a well-known African one. Another noticeable species is the "round" pompano (*Trachynotus falcatus*), which may be identical with an East Indian form; it has a more circular outline than the others and ranges northward to Vineyard Sound. It is not so good as the common pompano; and several other of the numerous species are almost worthless as food, though some, like the "banner" or "gaff-topsail" pompano of the Carolina and Gulf coasts (*Trachynotus glaucus*), are exceedingly handsome in form and color. The so-called pompano (*Rhombus simillimus*), so highly prized in southern California, is a somewhat different fish, being one of the true harvest fishes. See HARVEST FISH.

POMPEII, pŏm-pā'yē. An ancient city of Campania, built at the mouth of the river Sarnus (Sarno), looking out on the Bay of Naples. It stood only a few miles south of Mount Vesuvius, between Herculaneum and Stabiæ. It was founded as early as the sixth century B.C. by Oscans, who were later conquered by Samnites. The city fell under the power of Rome during the Samnite wars (342–290 B.C.), but retained autonomy in a measure. Under Sulla (80 B.C.) it became a Roman colony and later a favorite resort for wealthy Romans, many of whom, including Cicero and the Emperor Claudius, had villas in the suburbs. It was also a place of considerable trade and was the port town of Nola and other inland cities which studded the fertile valley of the Sarnus. Its population must have been about 20,000. The city was much damaged by an earthquake which occurred on Feb. 5, 63 A.D. In 79 occurred that terrific eruption of Vesuvius which in one day overwhelmed the towns of Pompeii, Herculaneum, and Stabiæ. (Consult Pliny the Younger, *Epistles*, vi, 16 and 20.) In course of time a small village rose at or near the spot; but the memory of Pompeii faded gradually, and for centuries its very site was unknown. The difficulty of discovering its true position was increased in consequence of the changes produced by the fearful convulsion of 79, which had hurled back the Sarnus from its ancient course and raised the sea beach to a considerable height, so that the rediscovered city to which merchantmen resorted of old is now a mile from the coast and a considerable distance from the stream that in ancient times ran near its walls. For more than 1500 years Pompeii lay undisturbed beneath heaps of ashes and cinders. In 1594–1600 an aqueduct for Torre Annunziata was tunneled under the ruins, but no particular notice was taken of them. It was not till 1748 that excavations were made in modern times. These operations, begun by the Neapolitan government, have been continued till the present time (and since 1860 with increased energy and in accordance with a well-considered plan; see FIORELLI) and have been exceedingly productive of objects that interest not only the antiquarian and the classical scholar, but the student of human life and social conditions in general. The remains found are in a remarkably good state of preservation, owing to the fact that the city was destroyed, not by lava, but by showers of wet ashes and cinders (lapilli), forming a light covering, which found their way into every nook and, when they dried, hermetically sealed up the town. Only about 2000 of the inhabitants perished. Around the bodies of some of these the ashes (mixed with rain) settled into a compactness that preserved the character of the mold after the bodies themselves had turned to dust. Into some of these molds liquid plaster has been poured by the excavators, and thus the forms of the bodies have been preserved (some of these bodies are to be seen in the small but valuable museum erected at Pompeii, near the Porta Marina). Not only did most of the inhabitants succeed in escaping during the eruption and in carrying with them their movable valuables, but they returned after the eruption had ceased, tunneled down into and around the houses and public buildings (the upper stories rose above the fallen ashes), and carried off almost everything of value, even to the extent of stripping movable slabs from the buildings (e.g., the larger theatre). This explains why so few objects of great value have been discovered.

What has been found affords us a remarkably realistic and complete picture of life in a small provincial city of Italy in the first century after Christ. Most of the movable objects discovered, and a large number of the best-executed wall paintings (e.g., see Colored Plate accompanying article on DECORATIVE ART) and floor mosaics, have been removed to the Royal Museum (Museo Nazionale) at Naples. Lately, however, one house of a family of wealth (the house of the Vettii) has been left, with all its equipments, as found; some parts of it, too, notably the peristyle (q.v.), have been reconstructed. About one-half of the city has already been excavated, and the circuit of the walls (about 2 miles) determined. Many years must elapse before the entire city can be laid bare. The most interest-



POMPEII

PRIVATE HOUSE, WITH MOUNT VESUVIUS IN THE DISTANCE

The view shows the atrium in the foreground, the peristylum in the rear, and the tablinum between these two.

ing discoveries recently have been those of the (unfinished) temple of Venus Pompeiana and of the remains of a number of fugitives carrying much jewelry and other valuables, whose attempted flight in the direction of Stabiæ was blocked by the ruin of the bridge over the Sarnus or by the lack of boats. They took refuge in a wayside inn and there perished. In 1912, in a street which connects the Via dell' Abbondanzia with the amphitheatre, seven houses were found, each with a balcony on the second story; the balconies are 20 feet long by 5 deep. (Consult the *Classical Weekly*, v, 190–191, New York, 1912, and *Notizie degli Scavi*, 1912.) The entire countryside around Pompeii abounded in residences of the wealthy, and rich returns doubtless await the excavators there. A beginning has been made near Boscoreale (q.v.), and the finding of a very valuable table service of silver at the bottom of a well in a villa is an indication of what may be expected elsewhere. The owner had thrown it there for safety when he fled and was unable to rescue it later.

Bibliography. The best books on Pompeii are: Mau, *Pompeii: Its Life and Art*, translated by Kelsey (2d ed., New York, 1902), with elaborate bibliography, and A. Mau, *Pompeii in Leben und Kunst* (Leipzig, 1908). For the current excavations, consult *Notizie degli Scavi*. Very valuable, too, is the account of Pompeii in K. Baedeker, *Southern Italy and Sicily* (16th Eng. ed., Leipzig, 1912). Other recent works of merit are: Overbeck-Mau, *Pompeii, in seinen Gebäuden, Alterthümern und Kunstwerken* (4th ed., Leipzig, 1884); Gusman, *Pompéi*, translated by Simonds and Jourdain (London, 1900); Weichardt, *Pompei vor der Zerstörung: Reconstructionen der Tempel und ihrer Umgebung* (Leipzig, 1897). Popular but useful works are: Fr. von Duhn, *Pompeji: Eine hellenistische Stadt in Italien* (ib., 1906); E. Thomas, *Roman Life under the Cæsars*, chap. i, on the *Graffiti* (q.v.; Eng. trans., New York, 1899); and G. Boissier, *Rome and Pompeii* (Eng. trans. by D. H. Fisher, New York, 1896; pp. 370–419, on the frescoes at Pompeii, are particularly good). On the frescoes found near Pompeii, consult Mau-Kelsey (referred to above), and A. P. Laurie, *Greek and Roman Methods of Painting* (Cambridge, 1910; see GREEK ART). Consult also Duhn and Jacobi, *Der griechische Tempel in Pompeji* (Heidelberg, 1890). For the discoveries near Boscoreale, consult Heron de Villefosse, "Le trésor de Boscoreale," in *Monuments Piot*, vol. v (Paris, 1899); Barnabei, *La villa Pompeiana di P. Fannio Sinistore scoperta presso Boscoreale* (Rome, 1801). The older works are in general not very trustworthy; among the most important for their illustrations are Mazois, *Les ruines de Pompéi* (Paris, 1824–38); Roux and Barre, *Herculaneum et Pompéi* (8 vols., ib., 1841); Nicolini, *Le case ed i monumenti di Pompei* (Naples, 1854–96); *Real Museo Borbonico* (16 vols., ib., 1824–57). On the paintings, consult: Zahn, *Die schönsten Ornamente und merkwürdigsten Gemälde aus Pompei* (Berlin, 1828–59); Rochette, *Choix de peintures de Pompéi* (Paris, 1844–53); D'Amélio, *Pompei: dipinti murali* (Naples, 1898 et seq.); and especially Helbig, *Untersuchungen über die campanische Wandmalerei* (Leipzig, 1873); id., *Wandgemälde der vom Vesuv verschütteten Städte Campaniens* (ib., 1868); Mau, *Geschichte der decorativen Wandmalerei in Pompei* (Berlin, 1882); Sogliano, "La casa dei Vetii in Pompeii," in *Monumenti antichi*, vol. viii (Milan, 1898). Important discussions are contained in Nissen, *Pompejanische Studien* (Leipzig, 1877), and Mau, *Pompejanische Beiträge* (Berlin, 1879). A full bibliography is given in Furchheim, *Bibliografia de Pompei, Ercolano e Stabia* (2d ed., Naples, 1891).

POMPE'IUS, GNÆUS MAGNUS, commonly known as POMPEY, or POMPEY THE GREAT (106–48 B.C.). A famous Roman general and statesman. He was a son of Gnæus Pompeius Strabo. At the early age of 17 he began to learn the military art under his father by service in the field against the Italians in the Social War (q.v.). Though so young, he gave proof of extraordinary valor and of remarkable energy of character. On the death of his father, in 87 B.C., Pompeius, then only 19 years of age, was left without a protector, and during the temporary triumph of the Marian party he was for some time in considerable danger. When Sulla (q.v.), to whose side he was attached, returned from Greece to Italy to oppose Marius (q.v.), Pompey hastened into Picenum, where he had considerable estates and influence, and there raised an army of three legions, with which he successfully opposed the forces of the Marian party, compelling them to quit the district and effecting a junction with Sulla. During the rest of the war he conducted himself with great prudence and valor and with such remarkable success that, on the restoration of peace in Italy, the conduct of the war against the remains of the Marian faction in Africa and Sicily was intrusted to him. He speedily performed this commission and on his return to Rome was honored with the name of Magnus (i.e., the great) and with a triumph which, for one who had not yet held any public office and was merely an *eques*, was an unprecedented distinction. His next exploits were the reduction of the followers of Lepidus, whom he drove out of Italy, and the extinction of the Marian party in Spain, led by the brave Sertorius (q.v.). This latter work was one of no small difficulty. Pompey suffered some severe defeats at the hands of Sertorius, and it was only after Sertorius had been assassinated that Pompey was able to put an end to the war. In returning to Italy he fell in with and defeated the remnants of the army of Spartacus (q.v.) and thus claimed the credit of concluding the Servile War.

He was now the idol of the people and, though legally ineligible to the consulship, was elected to that important office for the year 70, the Senate preferring to relieve him of his disabilities rather than provoke him to extreme action. Hitherto Pompey had belonged to the aristocratic party; but as he had of late years been looked upon with suspicion by some of the leading men of the Optimates (q.v.), he now publicly espoused the people's cause. He carried a law restoring the tribunician power to the people and aided largely in the passage of the bill of Aurelius Cotta (*lex Aurelia*), directing that the *judices* should for the future be taken from the Senate, the *equites*, and the *tribuni ærarii*, instead of from the Senate alone. In 67–66 B.C. Pompey performed a noble service for the Republic in clearing the Mediterranean of the Cilician pirates who had infested it in vast numbers (see CILICIA; GABINIUS, AULUS), and during the next three years (65–63) he conquered Mithridates, King of Pontus, and Tigranes, King of Armenia, annexed Syria to the

Roman dominions, took Jerusalem, and made Judæa tributary to Rome. On his return to Italy he disbanded his army and entered Rome in triumph for the third time, in 61. After his return he was desirous that his acts in Asia should be ratified by the Senate and that certain lands should be apportioned among his veteran soldiers. But the Senate declined to accede to his wish, and he therefore formed a close intimacy and mutual alliance with Cæsar. Crassus, who possessed enormous wealth, and who exercised a wide influence at Rome, was induced to forego his grudge against Pompey, and thus these three men formed among themselves that coalition which is commonly called "the first triumvirate" and which for a time frustrated all the efforts of the aristocratic party. This small oligarchy carried all before it.

Cæsar's daughter, Julia, was given in marriage to Pompey, and private relationship was thus made to bind tighter the tie of political interest. And now, for some years following, Cæsar was reaping laurels in Gaul and rising higher in popular esteem as a warrior and a statesman, while Pompey was idly wasting his time and his energies at Rome. But Pompey could not bear a rival. Jealousies sprang up; Julia died in 54. Pompey returned to his former friends, the aristocracy, whose great desire was to check Cæsar and to strip him of his command. Cæsar was ordered to lay down his office and return to Rome, which he consented to do, provided Pompey, who had an army near Rome, would do the same. The Senate insisted on an unconditional resignation and ordered him to disband his army by a certain day; otherwise, the Senate threatened, he would be declared a public enemy. To this resolution two of the tribunes in vain objected; they therefore left the city and cast themselves on Cæsar for protection. It was on this memorable occasion that Cæsar crossed the Rubicon and thus defied the Senate and its armies, which were under Pompey's command. The events of the civil war which followed have been recorded in the life of Cæsar. It remains only to mention that, after being finally defeated at Pharsalus in 48, Pompey escaped to Egypt, where, according to the order of the King's ministers, he was treacherously murdered by a former centurion of his own, as he was landing from the boat. His head was cut off and afterward presented to Cæsar on his arrival in Egypt. But Cæsar was too magnanimous to delight in such a sight and ordered that the murderer be put to death. Pompey's body lay on the beach for some time, but was at length buried by a freedman, Philippus, who had accompanied his master to the shore. See bibliography under Cæsar and Cicero. Consult the *Life of Pompey* by Plutarch; Cæsar, *De Bello Civili;* Lucan, *Pharsalia;* and the article "Pompeius, 18," in Friedrich Lübker, *Reallexikon des klassischen Altertums,* vol. ii (8th ed., Leipzig, 1914); also C. W. C. Oman, *Seven Roman Statesmen of the Late Republic* (New York, 1902).

POMPEIUS TROGUS. See Trogus Pompeius.

POMPELMOUS. See Shaddock.

POM'PEY THE GREAT. See Pompeius, Gnæus Magnus.

POMPEY the Younger (Sextus Pompeius) (75–35 B.C.). The second son of Pompey the Great, celebrated in Roman history for his resistance to Antonius and Octavianus. Hearing of the death of his father, he fled to Spain, finally escaping to the borders of the Lacetani and rallying in the mountain fastnesses a gang of banditti. He applied to the Roman Senate for the restitution of his father's property, which had been confiscated. He received a large sum of money from the public treasury and the title of commander of the seas. Marching southward, he crushed all opposition, took possession of Bætica, and assumed the state and authority of a sovereign. When he learned (43 B.C.) that a second triumvirate had been formed, and that he was among the proscribed, he resorted to piracy; his mariners boarded merchantmen, and Corsica, Sardinia, and Sicily fell into his power. Rome was reduced to the point of starvation by his interception of the grain ships; the people compelled Antonius and Octavianus to negotiate a peace, and a treaty was concluded advantageous to Sextus. Sicily, Sardinia, Corsica, and Achaia were given to him, and the consulship for the following year was promised to him. But hostilities were soon resumed, and in 36 a Roman squadron under Agrippa destroyed his fleet off Naulochus. Pompey fled, but after a few months was overtaken by M. Titius, carried to Miletus, and put to death. Consult the article "Pompeius, 20," in Friedrich Lübker, *Reallexikon des klassischen Altertums,* vol. ii (8th ed., Leipzig, 1914).

POMPEY'S PILLAR. The name of a celebrated column standing on a slight elevation in the southwest portion of ancient Alexandria, a short distance outside the Arabian walls. It is a monolith of red granite, of the Corinthian order, raised upon a pedestal. Its total height is 98 feet, 9 inches; shaft, 73 feet; circumference, 29 feet, 8 inches. The present name is a mere invention of travelers. The inscription on the base shows that it was erected by Publius, eparch of Egypt, in honor of the Emperor Diocletian, in the year 302 A.D., to commemorate his remission of part of the grain tribute. It stood in the centre of the court of the Serapeum (q.v.), or great sanctuary of Serapis, and survived its transformations into a church and a fortification.

POMPEY'S THEATRE. A theatre erected in Rome by Pompey, opened in 55 B.C., but not completed till 52. It was the first theatre built of stone, and, in deference to the popular prejudice against such construction for a place of amusement, the stone seats and steps were made to form the approach to a temple of Venus Victrix, built on top of the cavea. The interior was of marble and seated, according to Pliny the Elder, 40,000 spectators (modern authorities, however, give the capacity as 17,500 or even as low as 10,000). It was destroyed by fire on several occasions and was restored, continuing in use to the sixth century. Considerable remains exist, particularly under the Palazzo Pio. Consult S. B. Platner, *The Topography and Monuments of Ancient Rome* (2d ed., Boston, 1911), and Charles Knapp, "The Roman Theatre," in *Art and Archæology,* vol. i (Baltimore, 1915).

POM'PHOLYX. See Pemphigus.

POMPILIUS, Numa. See Numa Pompilius.

POM-POM. An automatic gun (see Machine Gun), extensively used in the Boer-British War of 1900, first by the Boers and afterward by the British. The name is often applied to that class of rapid-fire automatic gun whose calibre is greater than that of the shoulder rifle and less than that of the field gun. Its peculiar noise when being fired rapidly caused the British troops to speak of it as a pom-pom. It is very accurate and effective under favorable conditions and proved to be a formidable weapon.

POMPONAZZI, pŏm′pō-nät′sē, Pietro (1462–1525). An Italian philosopher, born at Mantua. He studied in his native city and at Padua, where he became a doctor of medicine in 1487, professor of philosophy (1488), and professor of natural philosophy (c.1495). He held a professorship at Ferrara from 1509 until 1512, when he went to Bologna. At the latter place he brought out his great work, *De immortalitate animi* (1516), in which he attacked the doctrines of Thomas Aquinas, thereby provoking a great controversy. Some of the orthodox Thomists were for taking his life. Consult A. H. Douglas, *Philosophy and Psychology of Pietro Pomponazzi* (New York, 1910).

POMPO′NIUS, Lucius. A Latin writer of Bologna (Bononia), who lived about 90 B.C. He was among the first to transform the hitherto improvised popular plays called *Atellanæ* (q.v.) into a regular branch of comic literature, by the introduction of written composition in the metrical forms and according to the technical rules of the Greeks. About 70 titles and plays by him are mentioned. The extant fragments, which are printed in Ribbeck's *Comicorum Romanorum Fragmenta* (3d ed., Leipzig, 1898), show that the author usually chose his subjects from low life. Consult J. W. Duff, *A Literary History of Rome* (London, 1909), and Martin Schanz, *Geschichte der römischen Litteratur,* vol. i, part i (3d ed., Munich, 1907).

POMPONIUS LÆTUS, Julius (or Pomponio Leto) (1428–98). An Italian humanist and a leader in the revival of learning. He was a natural son of one of the Sanseverini, a pupil of Lorenzo Valla, and an earnest student of Latin literature. He is most famed for his effort to pattern after the manners and morals of the ancients. He took Cato for his model and lived in the country, like the ideal farmer of Varro. He was persecuted by Paul II and imprisoned for a time, but was released although forbidden to renew the meetings of his academy. Consult Sabellicus, *Vita Pomponii Læti* (Strassburg, 1510), and J. E. Sandys, *A History of Classical Scholarship,* vol. ii (Cambridge, 1908).

POMPONIUS ME′LA. See Mela.

POM′ROY, Rebecca Rosignol (1817–84). An American nurse, born in Boston, Mass., the daughter of Samuel Holliday. In 1836 she was married to Daniel F. Pomroy. Sickness in her own family having brought her experience as a nurse, she offered her services at the outbreak of the Civil War. She was on duty at Georgetown Hospital, at West Hospital, Baltimore, and at the Hospital of Columbian University, Washington. In 1862 and again in 1864 she attended President Lincoln's family. At the close of the war Mrs. Pomroy was stricken with typhoid fever and was an invalid for several years. Later she became matron of a reformatory home for girls at Newton Centre, Mass., and then of the Newton Home for Orphans, now known as the Rebecca Pomroy Home.

POMUK, John of. See John of Nepomuk.

PONCA, pŏn̄′kȧ, or Ponka. A tribe of Siouan stock (q.v.), formerly claiming the territory upon the waters of Niobrara River, about the Nebraska-Dakota boundary. They speak a dialect of the same language spoken by the Omaha, Osage, Quapaw, and Kaw. The Ponca were living about the mouth of the Niobrara when visited by Lewis and Clark in 1804 and remained there, in spite of the inroads of the Sioux, until 1877, when, in consequence of their territory being included in a cession by the Sioux, the main body of the tribe was forcibly removed to what is now Oklahoma. During the march and after arrival they died off at so rapid a rate that the tribe was threatened with extinction, when the matter was brought to public attention, with the result that in 1880 a commission reported in favor of returning them to the north. Accordingly a portion of them returned and are now attached to the Santee agency, northeastern Nebraska. The majority, however, still remain in Oklahoma. Consult G. A. Dorsey, *Ponca Sun Dance* (Chicago, 1905), and A. C. Fletcher, *The Omaha* (Bureau of Ethnology Reports).

PONCA (pŏn̄′kȧ) **CITY.** A city in Kay Co., Okla., 64 miles north of Guthrie, on the Arkansas River and the Atchison, Topeka, and Santa Fe and the Hutchinson and Southern railroads and on the Arkansas River (Map: Oklahoma, D 2). It is the centre of a rich wheat district and carries on an important trade with Ponca and Osage Indians. There are flour mills, a tent-making factory, two oil refineries, a glass plant, and grain elevators. Natural gas is abundant. The city contains a Carnegie library. Pop., 1900, 2528; 1910, 2521.

PONCE, pôn′sā. The capital of the Department of Ponce, Porto Rico, and the second largest city of the island (Map: Porto Rico, C 3). It is situated on a plain bordered by hills 3 miles from the south coast and is well built, with clean macadamized streets, and houses chiefly of stuccoed brick or stone. The principal squares are the Plaza Principal and the Plaza de las Delicias, separated by the church of Our Lady of Guadalupe, and both containing gardens. Among other buildings are a Protestant church built of iron, several asylums and hospitals, and two theatres, the Teatro de la Perla being the best on the island. The city had in 1911, 61 graded schools, a kindergarten, the largest high school in the island, and five private schools. The city has a good water supply brought by an aqueduct more than 3 miles long. The chief industries are the manufacture of cigars, cigarettes, rum, carriages, hats, and lace. The city is a terminus of the American Railway and is connected with San Juan, Arecibo, and Mayaguez by good highways. An electric street railroad leads to the harbor of Playa de Ponce, a spacious bay accessible to vessels drawing 25 feet and provided with wharves. Here are the customhouse and the chief commercial houses. Ponce is one of the principal commercial ports of the island and is the chief centre of the export trade in coffee and sugar. Other exports are molasses, rum, and tobacco. Pop. (municipality), 1889, 55,477; 1910, 63,444; (urban) 1910, 35,027; Ponce was occupied by United States troops on July 27, 1898.

PONCEAUX, pôn′sō′. See Coal-Tar Colors.

PONCE DE LEÓN, pôn′thā dā lā-ōn′, Fray Luis. See León, Fray Luis de.

PONCE DE LEÓN, Juan (c.1460–1521). A Spanish governor of Porto Rico and discoverer of Florida. He was born at San Servas in the Kingdom of León. After serving as page to a tutor of the royal family, Juan Ponce in 1493 went to America on the second voyage of Columbus. In 1508 he went to Porto Rico and in 1510 was empowered to conquer the island, of which he became Governor. He rapidly acquired a considerable fortune there, so that when Diego Columbus appointed a successor to him, Ponce was able to fit out three ships, with which he started, March 3, 1513, to investigate some stories of a marvelous island named Bimini which the Indians said contained a spring which had wonderful curative properties. There is little in the original narratives to substantiate the legend that this was a Fountain of Perpetual Youth that Ponce was in search of. On March 27 land was sighted. He landed not far from the mouth of St. John's River, and on April 8, on Easter Sunday (Span. *Pascua Florida*), took possession of the country. A month later, May 8, having explored the coast carefully and having had two unsuccessful encounters with the natives, he doubled the point of the peninsula and started up the western coast. Proceeding to the neighborhood of Pensacola Bay, he then returned to the Florida Keys and crossed to Cuba. Thence he sailed to the Bahamas, where he was on July 25, and after two months more of cruising about the Bahamas he reached home Sept. 21, 1513. Ponce immediately took ship for Spain, where he secured permission to conquer and colonize the island (as he supposed it to be) of Florida. Returning in 1515, he was delayed by the necessity of conquering the Caribs from Guadeloupe who were overrunning Porto Rico and who inflicted several severe defeats upon the Spaniards. It was not until 1521 that he was again ready to set out for Florida. With two ships, carrying 200 men, he proceeded to a harbor, probably Charlotte Harbor or thereabouts, where he landed and prepared to build a settlement. The natives, however, attacked the white men so fiercely that they were soon compelled to reembark. A storm separated the vessels, one of which made its way to Vera Cruz, where it arrived just in season to assist Cortés at a critical period in his conquest. Ponce, who had been dangerously wounded in the knee by the Indians, turned back to Porto Rico in the other vessel, but died before arriving there. Consult Justin Winsor, *Narrative and Critical History of America*, vol. ii (New York, 1886), and Henry Harrisse, *Discovery of North America* (London, 1892).

PONCELET, pôɴs′lā′, JEAN VICTOR (1788–1867). A French engineer and mathematician, born in Metz. From 1807 to 1810 he attended the Ecole Polytechnique, where he studied under Monge. In 1812 he entered the army as lieutenant of engineers and was made prisoner on the retreat of the French from Moscow. He was taken to Saratov, on the Volga, where, away from all scientific assistance, he laid the foundations of projective geometry. On his return to Metz (1814) he continued his investigations. He found, however, no recognition in the Paris Academy and therefore published his contributions in *Crelle's Journal*. In 1829 he collected these essays in the *Traité des propriétés projectives des figures* (1822; 2d ed., 2 vols., 1865–66). He then turned his attention to applied mechanics and published several works on the subject. In 1835 he became professor of applied mechanics at Paris, and in 1848 he was raised to the rank of general. In 1851 he went to London as president of a commission to the International Exhibition and later published a report on his mission, *Machines et outils appropriés aux arts textiles* (3 vols., 1854–62), in the *Collection des travaux de la commission française*, which is of great importance in the history of technical science. He published in more complete form the work which he began at Saratov in the *Applications d'analyse et de géométrie* (1862–64). Poncelet is the real founder of modern geometry and had a very strong influence on German geometry, although at first he found little recognition in France. Some of his other works are: *Sur les roues hydrauliques verticales* (1826); *Théorie des effets mécaniques de la turbine Fourneyron* (1838); *Expériences hydrauliques* (1832), jointly with Lebros; *Introduction à la mécanique industrielle, physique ou expérimentale* (1829; 3d ed., 1870; Ger. trans., 1841–45); *Cours de mécanique appliquée aux machines* (1845; 3d ed., 1874–76; Ger. trans., 1845–49). Consult Didion, *Notice sur la vie et les ouvrages du général Poncelet* (Paris, 1869), and Bertrand, "Eloge historique de Poncelet," in the *Mémoires de l'Académie des Sciences* (ib., 1879).

PONCHIELLI, pŏn′kē-ĕl′lē, AMILCARE (1834–86). An Italian composer, born at Paderno Fasolaro, near Cremona. He was one of the most important Italian composers of the nineteenth century and, although little known to the world at large, was regarded by his countrymen as second only to Verdi. He was educated at the Conservatory of Milan and made his début as a composer with *I promessi sposi* (1856). Other operas were: *La savojarda* (1861); *Roderica* (1864); *La stella del monte* (1867); *Le due gemelle* (1873); *I Lituani* (1874); *La Gioconda* (1876); *Il figliuol prodigo* (1880); *Marion Delorme* (1885). He wrote the famous *Garibaldi Hymn* of 1882. Popular as he was in Italy, *Gioconda* was the only work of his that found favor abroad. He wrote many ballets and orchestral suites, and during the time he was maestro of the Piacenza Cathedral (1881–86) wrote considerable sacred music.

POND, JAMES BURTON (1838–1903). An American lecture manager, born in Cuba, Allegany Co., N. Y., and brought up in Illinois and Wisconsin. He was a journeyman printer in 1856 and for a time lived with John Brown in Kansas and was typesetter on the *Herald of Freedom*. In 1859 he joined the first settlers of Denver, Colo. Then for two years he edited the Markesan *Journal*, a Wisconsin weekly, and in 1861 volunteered in the Third Wisconsin Cavalry, with which he did border duty in Kansas and Missouri. Captain Pond was one of the 17 survivors out of 118 treacherously surprised and shot by Quantrell at Baxter Springs in 1863 and at the close of the war received the rank of major. From 1865 to 1873 he was in business in the West and then settled in Boston, where he bought the Redpath Lyceum Bureau. In 1879 he removed to New York City and established the American Lecture Bureau. Major Pond managed the tours of many noted lecturers, Henry Ward Beecher, Ralph Waldo Emerson, Charles Sumner, Wendell Phillips, John B. Gough, Thomas DeWitt Talmage, Thomas Nast, Mrs. Livermore, George Kennan, Mark Twain, and, among Englishmen, Canon Kingsley, H. M. Stanley, Matthew Arnold, Ian Maclaren, Anthony Hope, and Conan Doyle. Pond wrote *A Summer in England with Henry*

Ward Beecher (1886) and *Eccentricities of Genius* (1900).

POND, John (1767–1836). An English astronomer, born in London. At 16 he entered Trinity College, Cambridge, but was compelled to leave on account of impaired health and spent several years abroad. At his return he settled at Westbury, near Bristol, and erected there an altazimuth 2½ feet in diameter. His observations with this instrument, submitted to the Royal Society in a paper "On the Declinations of Some of the Principal Fixed Stars" (1806), showed that the Greenwich quadrant had changed its form and that a reëquipment of the Royal Observatory was necessary. In 1811 he was appointed Astronomer Royal. In this capacity he effected a reform of the national observatory and procured for it modern instruments. With the 6-foot mural circle mounted in 1812 he catalogued the north-polar distances of 84 stars. He introduced the use of the mercury horizon as a substitute for the plumb line and spirit level, and the method of observing the same object alternately by direct and reflected vision. Pond was also the inventor of the method of observing in groups and the multiplication method. He also showed the unreality of the parallaxes of certain stars observed by Brinkley. He received the Lalande prize in 1817 and the Copley medal in 1823. He was a member of the Board of Longitude and superintended the issuing of the *Nautical Almanac* (1832–33). In 1833 he completed a standard catalogue of 1113 stars. His scientific contributions appeared in the *Transactions* of the Royal Astronomical Society and the Royal Society. He also translated Laplace, *Système du monde* (1809).

PONDICHERRY, pŏn′dĭ-shĕr′rė, or **PONDICHERRI** (Fr. **PONDICHÉRY,** pôɴ′dē′shā′rē′). The chief of the French Establishments in India, the capital of which, a town of the same name, is the headquarters of their Governor. Area, 112 square miles, which is surrounded by the British district of South Arcot, in the Madras Presidency. The town is situated on the Coromandel Coast, in lat. 11° 56′ N. and long. 79° 49′ E., 122 miles by rail south of Madras (Map: India, D 7). The territory of Pondicherry is divided into four communes and comprises a large number of villages. Pop., 1901, 174,456; 1913, 172,043. The town of Pondicherry had, in 1901, 27,448 inhabitants; in 1913, 47,426. The town stands on a sandy plain and is divided by a canal into a European and a native town. Around a handsome square are grouped the Governor's residence, the Roman Catholic cathedral, the hôtel de ville, and the bazar. There is a wide promenade facing the sea. The town has a European college and an Indian school. The open roadstead is defended by a citadel and possesses a lighthouse. There is an iron pier over 450 feet long, and near its entrance are interesting monuments, including a statue of Dupleix (q.v.). An active import and export trade is carried on, the principal exports being groundnut kernels and oil, cotton fabrics, coconut oil, and rice. The spinning and weaving of cotton is the chief industry. Pondicherry is visited by French steamers sailing monthly between Colombo and Calcutta.

History. In 1683 François Martin collected about 60 Frenchmen and settled them in Pondicherry, which in 1674 he had purchased, with the surrounding territory, from a lieutenant of Sivaji, the great Mahratta conqueror. The Dutch took the town in 1693, but by the Treaty of Ryswick it was restored to the French in 1697. Dupleix (q.v.) was Governor of Pondicherry when war broke out between France and England in India. In 1748 Admiral Boscawen besieged Pondicherry, but two months later was compelled to raise the siege. In 1758 Lally became Governor-General of the French possessions in India and attacked the English settlement of Fort St. David, which surrendered and was totally destroyed. In 1761 Eyre Coote took Pondicherry. By the Peace of Paris (1763) Pondicherry was restored to the French with reduced territory. Pondicherry was again taken by the English under Sir Hector Monro in 1778 and restored in 1783. In 1793 the English repossessed themselves of it, but the Treaty of Amiens in 1802 again restored it to the French, though only till the following year. From this time it was held by the English till, by the treaties of 1814 and 1815, it was again restored to France, to whom it still belongs. Consult Quennefer, *Souvenirs de Pondichéry* (Lyons, 1882). See India.

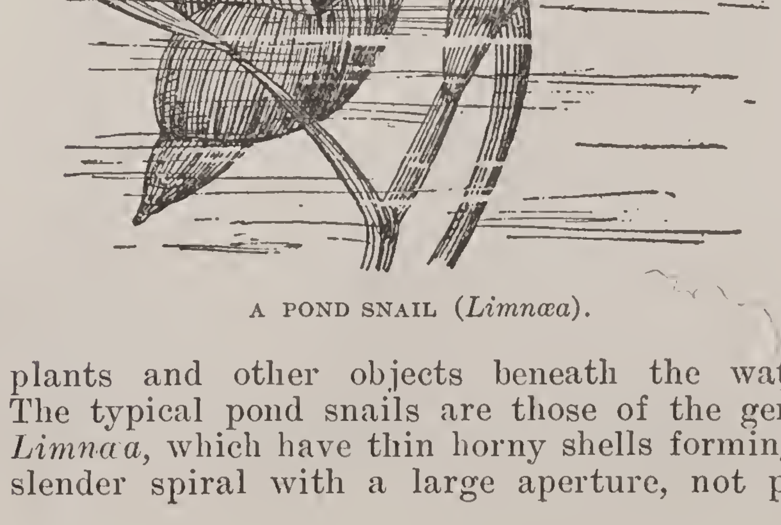
PONDICHERRY VULTURE. A small black-eared vulture (*Otogyps calvus*) of India, Burma, and Siam, which is especially characterized by the nakedness of the inside of the thighs. It is nowhere numerous and is called by the Hindus "king vulture," on account of its domineering manners. It nests in trees, adding year after year to the old structure until an enormous mass results. See Plate of Vultures.

POND LILY. See Water Lily.

PON′DOLAND. A mountainous and fertile district of Cape of Good Hope Province, situated on the southeast coast and covering an area of 3906 square miles. It was acquired by Great Britain in 1884, being the last remaining portion of independent Kaffraria, and was annexed to Cape Colony in 1894. Pop., 1911, 234,637 (1383 whites).

POND SCUMS. See Algæ; Chlorophyceæ

POND SNAIL. A snail of the pulmonate family Limnæidæ, which inhabit the fresh waters of temperate regions. All are vegetable eaters and seek their food beneath the water. They lay their eggs in clusters surrounded by a clear gelatin-like substance and attached to plants and other objects beneath the water. The typical pond snails are those of the genus *Limnæa*, which have thin horny shells forming a slender spiral with a large aperture, not pro-



A POND SNAIL (*Limnæa*).

tected by an operculum. When the ponds are frozen or dry up, they bury themselves in the mud and become dormant until released. The largest species (*Limnæa stagnalis*) is scattered abundantly over most of the Northern Hemisphere and may become 2 inches in length. Many other species are known in North America, most of them less than an inch long. A smaller, less-drawn-out shell, differing from *Limnæa* primarily in the fact that it is sinistral, while the shells of *Limnæa* follow the ordinary method of turning from left to right, is that of the genus *Physa*. It is more southerly in its distribution than *Limnæa*, but several species are found throughout the United States, one of which (*Physa heterostropha*) is exceedingly abundant. (See Physa.) Another prominent genus, with a large number of familiar species, is *Planorbis*, so called because its shell is coiled in a flat spiral like a roll of tape; none exceed ¾ of an inch in diameter. Among other genera may be mentioned *Ancylus* and *Gundlachia*, which are shaped nearly like limpets and have similar habits, although they inhabit fresh water alone and are not larger than grains of rice. All the pond snails are infested with parasites, and certain of them regularly form the hosts of the liver flukes of the genus *Distoma* during one stage of their development. Pond snails are not only interesting objects in an aquarium, but are of much utility in keeping the glass free from confervoid growths, upon which they constantly feed. Consult: W. G. Binney, *Land and Fresh-Water Shells of North America*, part ii (Washington, 1865); Cooke, "Shells," in *Cambridge Natural History*, vol. iii (London, 1895); Pelseneer, "Mollusca," in E. R. Lankester, *Treatise on Zoölogy*, vol. v (London, 1906). See Physa; Pulmonata; Snail.

PONEVEZH, pŏ′nȧ-vyĕzh′. A town in the Government of Kovno, Russia, situated 47 miles north-northeast of Kovno (Map: Russia, B 3). It has a Realschule and extensive manufactures of yeast, flour, and tobacco. Its trade in flax and flaxseed is also important. Pop., 1911, 13,750, mostly Jewish.

PONGI′IDÆ. A family name proposed by Elliot to take the place of Simiidæ, and including the orang-utans (*Pongo*), gorillas (*Gorilla*), and chimpanzees (*Pan*).

PONIATOWSKI, pō′nyȧ-tôf′skē. The name of a Polish family of Italian origin, descended from the family of the Torelli. A member of this family settled in Poland and assumed the name of Poniatowski from his wife's estate of Poniatow. The most notable members of the family were: Prince Stanislas Poniatowski (1676–1762), who joined Charles XII of Sweden in supporting Stanislas Leszczynski. He fought at Poltava (1709) and as the representative of Charles XII at Constantinople induced the Porte to declare war against Russia. He subsequently held high places at the court of Augustus III of Poland. His son Stanislas ascended the throne of Poland. (See Stanislas II.) Another son, Andreas, became the father of the most distinguished member of the family, Joseph Antony, Prince Poniatowski, the celebrated Polish commander in the army of Napoleon. The latter was born at Warsaw, May 7, 1762, and at the age of 16 entered the Austrian army, with which he made the Turkish campaign of 1787. In 1792 he returned to Poland and was named commander in chief of the army of the south. In 1792 he defeated superior Russian forces, but Poniatowski's uncle, King Stanislas, by joining the confederation of Targovitza, put an end to the contest in 1793. The Prince then resigned his command and went into voluntary exile, but returned in the following year to aid Kosciuszko, now Dictator, in his fruitless opposition to the third partition of Poland. On the proposal of Napoleon to reconstitute the Kingdom of Poland, Poniatowski joined the French (1800) at the head of a Polish force and did good service against the Russians. After the erection of the Duchy of Warsaw (1807) Poniatowski was appointed Minister of War, and in 1809, when the war between France and Austria was resumed, he drove the Austrians out of Polish territory and overran a considerable part of Galicia. In 1812 he joined the French army destined to invade Russia, with a Polish force of 100,000 men. The greater part of his army was broken up into detachments, which were incorporated with the various French legions, and Poniatowski was left with not more than 30,000 men under his direct command. At the head of this division he distinguished himself in the campaign, but was so severely injured at Smolensk during the retreat that he was obliged to return to Warsaw in December, 1812. He rejoined the French army in the autumn of 1813 and fought with such remarkable valor during the first day of the battle of Leipzig (see Leipzig, Battles of) as to gain the title of Marshal of France. When the French abandoned Leipzig, on October 19, Poniatowski was left with the remnant of his Polish division to protect the retreat. The only bridge across the Elster being wrecked through a mistaken order, he attempted to swim his horse across the river and had reached the farther bank when he fell back exhausted into the flood. His body was recovered six days later and was embalmed and carried to Warsaw, whence it was afterward removed to Cracow and placed beside the ashes of Sobieski and Kosciuszko.—Prince Joseph Poniatowski, a second cousin of the preceding, musical composer, author of *Don Desiderio* and other operas and several masses, was born in Rome, Feb. 21, 1816, and died in London, July 4, 1873. Consult Boguslawsky: *Biographie des Fürsten Jos. Ant. von Poniatowsky* (Cracow, 1831).

PONS, pôɴs, Jean Louis (1761–1831). A French astronomer, who was called the "hunter of comets" (*le chasseur de comètes*). He was born at Peyres, Hautes-Alpes; was employed in 1789 at the Marseilles Observatory, where he became associate director; and was director of the observatory near Lucca in 1819–25 and at Florence thereafter. Pons discovered 37 comets between 1801 and 1827.

PONS ÆL′LII. The name of a Roman camp in Britain out of which sprang Newcastle-upon-Tyne (q.v.).

PONSAN, Edouard Bernard. See Debat-Ponsan, E. B.

PONSARD, pôɴ′sär′, François (1814–67). A French dramatist, leader of the School of Good Sense in a reaction from the dramatic vagaries of romanticism. He was born June 1, 1814, at Vienna. He studied law, but soon gave it up for letters, at first as a follower of Hugo, in which capacity he translated Byron's *Manfred* (1837). His reaction from romanticism was heralded by the tragedy *Lucrèce* (1843), which, aided by the genius of Rachel, achieved in 1853 great popularity. He followed this by *Agnès de Méranie* (1846), *Charlotte Corday* (1850), *Horace et Lydie* (1850), *Ulysse* (1852), *L'Honneur et l'argent* (1853), his best comedy, *La bourse* (1856), *Le lion amoureux* (1866), and *Galilée* (1867), but from 1853 onward his reformed classicism was superseded by the modern social drama inaugurated by Dumas the Younger and his own former pupil Augier. The Academy elected him a member in 1855. He died in Paris, July 13, 1867. *L'Honneur et l'argent* still holds the stage. His characterization in general is shallow, and his situations are sentimental and romanesque, but his verse is sonorous and his style clear. Ponsard's works were collected in 3 volumes (1876).

PONS AS'INO'RUM (Lat., asses' bridge). The name properly given, from its supposed difficulty to beginners, to the fifth proposition of the first book of Euclid, that the angles at the base of an isosceles triangle are equal to each other.

PONS SUBLI'CIUS (Lat., bridge of piles, from *pons*, bridge, + *sublica*, stake, pile). The earliest bridge over the Tiber, said to have been built by Ancus Marcius (q.v.). See ROME, *Ancient*, end of first paragraph; PONTIFEX; PORSENA.

PONS VARO'LII. See NERVOUS SYSTEM AND BRAIN.

PONTA DELGADA, pŏn'tȧ dĕl-gä'dȧ. The principal city of the Azores, situated on the south coast of the island of St. Michael's (São Miguel) (Map: Spain, B 5). It has a roadstead protected by a breakwater, 2800 feet long, and an extensive commerce and shipping. The chief exports are oranges, lemons, and other fruits, most of which are shipped to England. Pop., 1900, 17,675; 1911, 16,179.

PONT-À-MOUSSON, pôɴ'tȧ-mōō'sôɴ'. A town in the Department of Meurthe-et-Moselle, France, 17 miles northwest of Nancy by rail (Map: France, N., L 4). The Moselle flows through the town, which is situated in a fruitful valley. The principal buildings are the fine Gothic church of St. Martin, the sixteenth-century late Gothic church of St. Laurent, the hôtel de ville, and a handsomely ornamented Renaissance house, the last two on the triangular and arcaded Place Duroc. The town is dominated on the east by a hill 1010 feet high, crowned by a ruined castle and the village of Mousson. There are manufactures of pottery, woolens, plush, velvet, beet sugar, and extensive iron foundries. In the early part of the European War which broke out in 1914 Pont-à-Mousson was captured by the German army which invaded France. Several unsuccessful attempts were made by the French to regain the town. See WAR IN EUROPE. Pop., 1901, 12,847; 1911, 14,009.

PONTANO, pŏn-tä'nō, GIOVANNI GIOVIANO, or **PONTA'NUS**, JOVIANUS (1426–1503). An Italian poet and scholar, born at Cerreto in Umbria. Civil feuds compelled him to leave his birthplace, and after 1448 he lived in Naples. There he was honored by the Aragonese dynasty and subsequently served as Prime Minister for 10 years. When Charles VIII of France entered Naples in 1495, he was welcomed by Pontano, an act punished by disgrace upon the return of the Aragonese. When at least 65 years of age, Pontano took as his second wife a beautiful girl of Ferrara. It was in her honor that he wrote the elegies known as *Eridanus*. His *Urania* and *De Hortis Hesperidum* are didactic poems in Latin. The Aldi at Venice published his verse (2 vols., 1505–08) and his prose, rhetorical in style (3 vols., 1518–19). Pontano founded the Neapolitan Academy of his day.

PONTARLIER, pôɴ'tȧr'lyȧ'. The capital of an arrondissement in the Department of Doubs, France, situated near the Swiss boundary, 26 miles southeast of Besançon (Map: France, N., M 6). It is fortified and occupies a very important strategic position at the entrance to the Défilé de la Cluse, one of the principal passes over the Jura. In 1871 the town was captured by the Prussians, and the French Army of the East was forced to retreat into Swiss territory. Pop., 1901, 7963; 1911, 8776.

PONTASSIEVE, pŏn'tȧs-syā'vȧ. A town in the Province of Florence, Italy, situated at the junction of the Sieve with the Arno, 9 miles by rail east of Florence (Map: Italy, C 3). It is a walled town with well-kept streets, a fine square, and an old castle. The inhabitants are engaged chiefly in agricultural pursuits. Annual fairs are held, and there are manufactures of railway supplies, agricultural implements, and glass. Pop. (commune), 1901, 13,405; 1911, 15,561, (town) 4900.

PONTCHARTRAIN, pŏn'char-trān', LAKE. A large salt-water lake in the southeastern part of Louisiana (Map: Louisiana, J 6). It is about 36 miles long and about 22 miles in maximum width, and communicates eastward with Lake Borgne and Mississippi Sound by the Rigolets Pass, through which the tidewater flows, while on the west it is connected by Pass Manchac with the smaller Lake Maurepas. Its general depth is from 10 to 16 feet. On its south shore, which comes within 5 miles of the Mississippi River, are the north suburbs of New Orleans, and two canals navigable for small vessels reach to the heart of the city, where they terminate in basins. The south shores are low and in parts marshy, with cypress swamps on the west. The north shore is elevated and healthful, being adjacent to the pine barrens, and affords good sites for summer residences and resorts.

PONTE, pŏn'tȧ, JACOPO DA. See BASSANO.

PONTE, LORENZO DA (1749–1838). An Italian librettist and teacher, who lived for many years in the United States. He was born at Ceneda, Venetia, and studied for five years in the seminary there. He taught rhetoric at the University of Treviso, was appointed by Joseph II court poet at Vienna, and while there served as librettist to Mozart, for whom he wrote the librettos *Le nozze di Figaro*, *Don Giovanni*, and *Così fan tutte*. When the Emperor Joseph died in 1790 Ponte left Vienna, lived in London and in Holland for a time, and after 1805 resided in the United States, where he became a teacher of Italian in New York City and professor of Italian at Columbia College.

PONTECORVO, pŏn'tȧ-kŏr'vō. A city in the Province of Caserta, Italy, situated on the Garigliano, 53 miles northwest of Naples (Map: Italy, D 4). It has a cathedral with mediæval manuscripts, fine churches, a Gymnasium, and an old castle. There are manufactures of rope, hats, and macaroni. Pontecorvo formerly belonged to the Papal States. In 1810 Napoleon I gave the title of Prince of Pontecorvo to Marshal Bernadotte. Pop. (commune), 1901, 12,237; 1911, 11,354.

PONTEDERA, pŏn'tȧ-dā'rȧ. A town in the Province of Pisa, Italy, situated at the junction of the Era with the Arno, 13 miles southeast of Pisa, with which it is connected by steam tramway (Map: Italy, C 3). The town has bridges over both rivers, a thirteenth-century church, and a Gymnasium. The weaving of woolen and cotton cloth and the manufacture of oil and chicory are the chief industries. Pop. (commune), 1901, 13,044; 1911, 15,673, (town) 9600.

PONTEFRACT, pŏn′tē-frăkt. A market town and municipal borough in Yorkshire, England, 21 miles south-southwest of York (Map: England, E 3). There are a grammar and a national school, and other schools, several almshouses, a large workhouse, and a splendid market hall. The town owns its water, cemetery, markets, and recreation grounds. Its trade is chiefly in agricultural and garden produce, cattle, and malt; licorice is largely cultivated for the Pontefract cakes, known since 1562. The castle of Pontefract was built shortly after the Conquest. It was the scene of the imprisonment and death of Richard II, and here also Rivers, Grey, and Vaughan were put to death at the instigation of Richard III. It was besieged four times during the Civil War and was dismantled in 1649. There are but meagre remains of the structure. Pop., 1901, 13,400; 1911, 15,949.

PONTE MOLLE. See MILVIAN BRIDGE.

PONTEVEDRA, pŏn′tā-vā′drȧ. The capital of the province of the same name in Galicia, Spain. It is situated in a beautiful and fertile valley at the head of a bay on the northwest coast of the peninsula (Map: Spain, A 1). A stream flowing through the town is crossed by a Roman bridge (*pons vetus*) of 12 arches. The town is well built, with spacious streets and beautiful alamedas or promenades lined with trees. There are a number of convents and monasteries, a Gothic church, and many modern buildings, the finest of which is the provincial government palace built in 1889. Sardine fisheries and manufacturing are leading industries. Pop., 1900, 22,806; 1910, 24,222.

PONTEVEDRA. A town of Negros, Philippines, in the Province of Western Negros, situated on the west coast of the island, 22 miles south of Bacolod. Pop., 12,000.

PON′TIAC (c.1720–69). A famous chief of the Ottawa Indians and leader of the confederate tribes of the Ohio valley and Lake region against the English in 1763–65. He was born in what is now northwestern Ohio, his mother being an Ojibwa. He distinguished himself in the French service at an early age, and is said to have led the warriors of his own tribe against Braddock in 1755. When Major Rogers was sent out in 1760 to take possession of the Western posts in behalf of the English government, he was halted by Pontiac near the present city of Cleveland with the significant warning, "I stand in the path," but finally with Pontiac's consent he proceeded on his way to Detroit. Pontiac professed loyalty to the English King, apparently in good faith, but in a short time he organized a confederacy which embraced virtually all the tribes from the head of Lake Superior almost to the Gulf coast. His declared object was to drive out the English and recover the country for the Indians, who were still to hold themselves friendly to the French. According to the arrangement the warriors of each tribe, on a concerted day, early in May, 1763, were to attack the garrison in their immediate neighborhood. Pontiac himself was to lead the assault at Detroit. Throughout the great wilderness extending from the Pennsylvania frontier to Lake Superior there were then 14 English (formerly French) posts, of which the most important were those at Fort Pitt, Detroit, and Mackinaw. The attacks were made as planned, and the Indians captured all but four of the 14 posts, Niagara, Pitt, Ligonier, and Detroit. Mackinaw was taken by a stratagem and the entire garrison was massacred. A plot for the capture of Detroit seems to have been betrayed to the commanding officer, Major Gladwin, by an Indian girl, and completely failed, whereupon Pontiac at once laid siege to the post. The siege continued five months, varied by desultory attacks and sorties, and attempts to relieve the fort with men and supplies. The most notable event of the siege was the action at Bloody Bridge, July 31, 1763, in which a sortie of troops was repulsed by Pontiac. Forts Pitt and Ligonier, to which the Indians had laid siege, were relieved by Colonel Bouquet, who defeated the Indians at Bushy Run, near the former post. Reënforcements finally succeeded in entering Detroit; Pontiac's men began to desert him, and the news of the signing of a treaty of peace between France and England removed all hopes of French aid. Pontiac, thoroughly discouraged, thereupon raised the siege of Detroit. In 1764 Bouquet led a second expedition into Ohio, which compelled the tribes to submission; and on Aug. 17, 1765, Pontiac himself entered into a formal treaty of peace at Detroit, which he confirmed at Oswego with Sir William Johnson the following year. He was murdered at Cahokia, Ill., in 1769, by an Illinois Indian, who seems to have been bribed by an English trader. Consult Parkman, *Conspiracy of Pontiac* (Boston, 1851; new ed., 2 vols., New York, 1908).

PONTIAC. A city and the county seat of Livingston Co., Ill., 91 miles southwest of Chicago, on the Vermilion River and at the junction of the Wabash, the Chicago and Alton, and the Illinois Central railroads (Map: Illinois, H 4). It is the seat of the State Reformatory, and has a hospital, a fine public library, a courthouse, city hall buildings, and two parks. The commercial interests of the city are important, the surrounding region being a productive farming and stock-raising country, possessing extensive deposits of bituminous coal. The principal industrial establishments are shoe factories, with a large product, manufactories of candy, and a canning factory. The government is vested in a mayor, elected every two years, and a unicameral council. It was founded in 1829 by settlers from Ohio and Indiana, and was first incorporated in 1856, receiving a city charter in 1872. Pop., 1900, 4266; 1910, 6090.

PONTIAC. A city and the county seat of Oakland Co., Mich., 26 miles northwest of Detroit, on the Clinton River and on the Grand Trunk and the Pontiac, Oxford, and Northern railroads (Map: Michigan, F 6). It is situated in a picturesque lake region, noted for its hunting and fishing, is the seat of the State Hospital for the Insane, with grounds occupying more than 500 acres, and has a public high school library and a ladies' library, the latter possessing its own building. Pontiac has a large trade in wool, fruit, and farm produce, and is a growing industrial centre, the manufactures including automobiles and accessories, buggies, wagons, farm machines, straps, springs, forgings, paints, varnishes, foundry products, and flour. The water works are owned and operated by the municipality. Named in honor of the famous Ottawa Indian chief, Pontiac was settled in 1818, and was chartered as a city in 1861 (having been incorporated as a village in 1837). The commission form of government was adopted in 1911. Pop., 1910, 14,532; 1915 (U. S. est.), 17,042.

PONTIANAK, pŏn′tē̇-ȧ-näk′. The chief town of the Dutch possession of West Borneo, situated on the west coast of the island, right under the equator (Map: East Indies, C 5). It is one of the principal ports of Borneo and the seat of a Dutch resident. Pop. (est.), 14,000.

PONTIANUS, pŏn′shĭ-ā′nŭs, Saint. Pope, 230–235. He took part in the controversy between Origen (q.v.) and Demetrius, favoring the latter. The greater part of his pontificate fell under the reign of Alexander Severus, who was well disposed towards the Christians, but a new persecution broke out on the accession of Maximinus, and Pontianus was banished to Sardinia, where he died from harsh treatment. His day is November 19.

PONTICELLO, pȯn′tē̇-chĕl′lȯ (It., little bridge). In music, the bridge of a bow instrument. *Sul ponticello* is the direction given to violinists to play with the bow near the bridge, which produces a hard, sharp tone. The opposite of *sul ponticello* is *flautando,* which calls for a clear, sweet flutelike tone produced by drawing the bow across the string at some distance from the bridge.

PON′TIFEX (Lat., bridge maker; probably from *pons*, bridge + *facere*, to make. R. G. Kent, in *Classical Philology*, viii, Chicago, 1913, holds that *pons* originally meant "path," especially between men and the gods; the pontifex, then, kept this path open. The ordinary view had explained the name as given because of the function of the pontifex as builder and repairer of the famous Pons Sublicius over the Tiber). The title borne by the members of one of the four great priestly colleges among the Romans. The other three were the *collegium augurum* (see Auguries), the *collegium XV virorum sacris faciundis,* and the *collegium VII virorum epulonum.* The last two were of younger origin. The former of these two (consisting at first of 2, then 10, and after Sulla of 15 members) was instituted to have charge of the Sibylline books and the oversight of the foreign cults, classed as *Græcus ritus,* while the latter (of 3, 7, and 10 members) relieved the pontifices of their duties in connection with the sacrificial banquets of the Roman and the plebeian games. The *collegium pontificum* in its widest and technical meaning included several elements. Besides the *rex sacrorum,* who had succeeded to the priestly duties of the King, the flamines (see Flamens), and the six vestal virgins, there were the pontifices, properly so called, whose number increased from 3 to 6, 9, 15, and 16. At their head was the *pontifex maximus.* This college was the guardian of all the ceremonial attending the worship of the ancient Roman gods (*patrius ritus*). It had charge of the calendar; its members alone possessed knowledge of the prayers and rites needed for the proper performance of religious ceremonies; they were consulted about the rites which the appearance of prodigies might require from the state or from individuals, and by their replies established a large body of law affecting religious observances and duties, based upon the mass of precedent with which they were familiar. From their number the pontifex maximus was elected, after 212 B.C. and perhaps earlier, by an assembly of 17 tribes chosen by lot. He was, as it were, the legal embodiment of the collective body of pontifices, and possessed over the other members of the great college an authority which preserves plain traces of original absolutism. The pontifices filled vacancies by their own vote, but the rex and the flamines were appointed, even against their will, by the pontifex maximus, though in later times his choice was limited by a list of nominations. The vestal virgins also were originally chosen by him, though later the lot decided from 20 names of his choosing. He had the power to fine his colleagues, and even to remove the rex and the flamines. To the vestals he stood in the position of a father, and could inflict corporal punishment upon them, though the death penalty for unchastity could be inflicted only by the college. In the time of the Empire the office of pontifex maximus regularly belonged to the prince, and a *promagister* was named to preside over the college. The pontifices are among the oldest Roman officials, evidently belonging to the regal period as a council of the monarch. Their importance is shown by the fact that with the augurs they are the only priests regularly provided for the colonies. Originally all the pontifices were patricians, but in 300 B.C. the Lex Ogulnia provided that five of the nine pontifices and five of the nine augurs should be plebeians. Later, when the numbers were increased, the majority appear to have been drawn from patrician families. Even with the growth of Christianity the pontifices and vestals continued to exist, though the Emperor Gratian resigned the title of pontifex maximus, and it was not till the end of the fourth century that the edicts of Theodosius put an end to the forms of the old Roman religion. Consult: Bouché-Leclercq, *Les pontifes de l'ancienne Rome* (Paris, 1871); Bardt, *Die Priester der vier grossen Collegien* (Berlin, 1871); Marquardt, *Römische Staatsverwaltung* (2d ed., Leipzig, 1884); Mommsen, *Römisches Staatsrecht* (ib., 1887–88); Habel, *De Pontificum Romanorum inde ab Augusto usque ad Aurelianum Condicione Publica* (Breslau, 1888); W. W. Fowler, *Roman Festivals* (London, 1899); id., *The Religious Experience of the Roman People* (ib., 1911); G. Wissowa, *Religion und Kultus der Römer* (2d ed., Munich, 1912).

PONTIFEX MAXIMUS. See Pontifex.

PONTIF′ICAL (ML. *pontificale*, book of offices, from Lat. *pontificalis*, relating to a pontiff, from *pontifex*, high priest). 1. The name in Roman Catholic usage of the book containing the several rites in which the bishop exclusively, or at least a priest delegated by the bishop, officiates. There were many such collections for the various national churches; but that which is now in universal use throughout the Western Church is the *Pontificale Romanum*, edited by the papal master of ceremonies Burchard and published at Rome in 1485. It was revised by Clement VIII and its use extended to the whole Latin church in 1596. The current edition is that published at Regensburg in 1888 by authority of Leo XIII. Another of the service books of bishops is called the *Ceremoniale Episcoporum*, but it is chiefly confined to a description of the peculiar ceremonial with which bishops are required to celebrate solemnly those offices, as of the mass, vespers, and the funeral office, which are common to them with priests. Consult Catalanus, *Pontificale Romanum* (Paris, 1850). 2. In the plural, "pontificals" (*pontificalia*) is used collectively for the articles of garb and ornaments used by bishops in the exercise of ecclesiastical functions. Consult Barbies de Montault, *Le costume et les usages ecclesiastiques* (2 vols., Paris, 1897–1901).

PONTIFICAL BOOK, The. See Liber Pontificalis.

PONTIFICAL STATES. See Papal States.

PONTIGNY, pôɴ′tē̇′nyē̇′. A village in the Department of Yonne, France, 32 miles southwest of Troyes. Pop., 1901, 778; 1911, 805. It is noted for its extensive Cistercian abbey, founded by Count Thibaud of Champagne in 1150, and frequently the asylum of the archbishops of Canterbury when at variance with the English kings. Thomas à Becket found refuge there in 1164, Stephen Langton in 1208, and Edmund Rich in 1239. The abbey and church were much damaged by the incendiarism of the Huguenots in 1568. The church has been restored and is now a national monument and a pilgrimage resort, especially of British Roman Catholics. It is one of the most perfect survivals of unadorned early Gothic. Some of its distinctive features are a small open narthex and the narrow lancet-shaped windows.

PON′TINE ISLANDS. See Ponza Islands.

PONTINE MARSHES (Lat. *Pomptinæ Paludes*). A low-lying district, forming the southern part of the Campagna di Roma (q.v.) and extending in a southeasterly direction from Cisterna to the sea at Terracina. Its greatest length is about 31 miles and its breadth from 5 to 8 miles. It does not reach the seacoast on the west, being separated from it by a broad sandy tract covered with forest; but even this barrier partakes to some extent of the character of the marshes themselves, being quite as flat and largely intermixed with swamp and lagoon. The Pontine Marshes were undoubtedly formed by the stagnation of the streams that take their rise in the Volscian hills and by the accumulation of sand along the shore from Astura to the Circean promontory, but this formation undoubtedly belongs to prehistoric ages. The first attempt to drain the Pontine Marshes in ancient times was made in 160 B.C., by the consul Cornelius Cethegus, but his efforts were only partially successful. Julius Cæsar projected the drainage of this pestilential district, but his murder prevented the complete realization of his project. Augustus also appears to have done something; but in the time of Juvenal it was a mere haunt of robbers. Theodoric the Goth likewise tried to reclaim it; but the desolations of succeeding reigns soon reduced it to a hopeless condition, and it remained an uninhabitable region. The first in modern times to resume the labors of the ancients was Pope Boniface VIII, who drained the district about Sezze and Sermoneta by means of a large canal. Several subsequent efforts were made, but nothing was really accomplished till the time of Pope Pius VI, who, in 1778, began to drain the marshes and completed the drainage in 10 years. The reclamation of the land, however, has been found possible only in part. Though much is under cultivation and in pasturage, a great portion is apparently irreclaimable, and the whole region is so unhealthful that during the summer months the inhabitants are obliged to remove to the neighboring mountains. Consult: Prony, *Description hydrographique et historique des Marais Pontins* (Paris, 1823); H. Nissen, *Italische Landeskunde,* vol. i (Berlin, 1883); De la Blanchère, *La malaria de Rome et le drainage antique* (Paris, 1884); Berti, *Le Paludi Pontine* (Rome, 1884); Donat, *Le Paludi Pontine ed il loro prosciugamento* (ib., 1887); G. Tomassetti, *La Campagna Romana,* vol. ii (ib., 1910).

PON′TIUS, Gaius. A chieftain of the Samnites (q.v.), who defeated the Romans at the Caudine Forks (q.v.).

PONTMARTIN, pôɴ′mär′tăɴ,′ Armand Ferrand, Count de (1811–90). A French author, born at Avignon and educated in Paris. He entered journalism in 1830 and later became a critic and satirist. His best works were *Causeries littéraires* (1845–56); *Causeries du samedi* (1857–81); *Semaines littéraires* (1861–63); *Souvenirs d'un vieux critique* (1881–89). In these, in his *Mémoires* (1885–86), and in his many novels he showed himself master of a brilliant style.

PONTOISE, pôɴ′twäz′. The capital of an arrondissement in the Department of Seine-et-Oise, France, 17 miles northwest of Paris by rail, at the confluence of the Oise and the Viorne (Map: France, N., G 3). The town rises from the Oise in an amphitheatrical form on a hill crowned by the twelfth-century Gothic church of St. Maclou. The churches of Notre Dame and St. Maclou, the hôtel de ville, the museum, and the hospital are also notable buildings. There are remains of mediæval fortifications. Pontoise has a considerable commerce in grain, and manufactures mill machinery, chemicals, and hosiery. It was the Briva Isaræ, a village antedating the Roman conquest, and was destroyed by the Northmen in the ninth century. It became the capital of the Vexin Français, and was the frequent residence of the Capetian kings. Pop., 1901, 8180; 1911, 9023.

PONTOON′. See Bridges and Docks, Military.

PONTOPPIDAN, pŏ̇n-tôp′ē̇-dȧn, Erik Ludvigsen (1698–1764). A Danish prelate. He was born at Aarhus, Jutland, and studied theology as well as geography and history at the University of Copenhagen. He was made chaplain to the King in 1735, professor of theology at Copenhagen in 1738, Bishop of Bergen, Norway, in 1747, prochancellor of the University of Copenhagen in 1755. He was a learned man and the leader of the Pietists in Denmark. Among his numerous publications were: *A History of the Church in Denmark* (1741–47); *A Natural History of Norway* (1752–53; Eng. trans., London, 1755); *An Account of the Geography, Natural History, and Antiquities of Denmark* (7 vols., 1763–81). His *Explanation of Luther's Catechism* (1737) was used as a textbook for many years in the schools of Denmark, and is still used in Norway and among people of Norwegian descent in the United States.

PONTOPPIDAN, Henrik (1857–). A Danish novelist, born in Fredericia and educated at the University of Copenhagen. His first book, *Stäkkede Vinger* (1881), immediately gained for him a prominent position among the younger Danish writers and marked him as a broad and accurate observer of social and political conditions among the Danish peasantry. His earlier writing betrays imitation of the Norwegian novelist Kielland, but in *Fra Hytterne* (1887), *Folkelivsskildringer* (1888–90), and the trilogy *Muld* (1891), *Det forjättede Land* (1892), and *Dommens Dag* (1895), his originality and narrative power are strongly apparent. His other writings include *Sandinge*

Menighel (1883); *Landsbybilleder* (1883); *Lykkeper* (8 vols., 1898–1904; 2d ed., 3 vols., 1905); *Den gamle Adam* (1905); *Ung Elskov* (1906); *Aasgaardsrejen* (1906); *Den kongelige Gæst* (1908), a drama; *Storeholt* (1913).

PONTOR′MO, JACOPO DA (properly JACOPO CARUCCI) (1494–1557). An Italian painter of the Florentine school, called Pontormo from the place of his birth. He was a pupil of Leonardo da Vinci, Albertinelli, Piero di Cosmo, and finally of Andrea del Sarto. The "Visitation" (1516), in the church of the Annunciation, Florence, is in the style of the last-named master. But he was influenced also at different times by Dürer and Michelangelo and his admiration for the latter caused a deterioration of his personal style. At his best he shows a rare instinct for the decorative, great feeling for line, and poetic fancy, as in the lunette at Poggio a Caiano, called by Berenson "the most appropriate mural decoration now remaining in Italy." Almost as fine is the dreamlike "Deposition," at Santa Felicità, Florence. His portraits also are of the highest order, but many of his later works are meaningless caricatures of Michelangelo. His best portraits include those of Cosimo de' Medici (San Marco, Florence); "Lady with Dog" (Städel Institute, Frankfort); "A Cardinal" (Borghese Gallery, Rome). Among his drawings are many real masterpieces. Consult Bernhard Berenson, *Drawings of the Florentine Painters* (New York, 1903); id., *Florentine Painters of the Renaissance* (ib., 1909).

PONTREMOLI, pŏn-trĕm′ŏ-lē. An episcopal city in the Province of Massa e Carrara, Italy, situated on the south slope of the Apennines, on the Magra, 37 miles southwest of Parma (Map: Italy, B 2). It has a cathedral and an episcopal library. There are manufactures of silk, oil, and lime and a trade in wine, fruit, and cattle. There are also marble quarries and mineral springs. Pontremoli was a republic in the twelfth century. Pop. (commune), 1901, 14,194; 1911, 16,176.

PON′TUS (Lat., from Gk. Πόντος, *Pontos*). The ancient name of a district in the northeastern part of Asia Minor, bordering on the Pontus Euxinus (whence its name) and extending from the river Halys (now Kizil Irmak) in the west to the frontiers of Colchis and Armenia, a short distance beyond the modern Batum, in the east. Its southern limits were the ranges of Anti-Taurus and Paryadres, so that it corresponded pretty nearly to the modern provinces of Trebizond and Sivas. On the east and the south Pontus is mountainous, but along the coast there are large and fertile plains which in ancient times produced, and indeed still produce, abundance of grain, fruits, and timber. Game, according to Strabo, who was a native of Amasia, also was plentiful. Apiculture was common, and honey and wax were among the chief articles of commerce. Iron was the principal mineral. Besides the Halys at the west the chief rivers were the Iris and its tributary, the Lycus, and at the east the Acampsis. Small, but famous from its association with the Amazons, was the river Thermodon.

Pontus was not an ethnological, but purely a geographical, division. The name does not occur before the fourth century B.C., and is not common till after the time of Alexander the Great. Properly the region was called Cappadocia ad Pontum. The early inhabitants appear to have been barbarous but warlike tribes, over whom the monarchs of Assyria, Lydia, and even Persia had but little more than a nominal control, though the region formed one of the satrapies under Darius. The advantages of the fertile coast and the prospects of trade early attracted Greek merchants, and the Argonautic epic (see ARGONAUTS) reflects the voyages of the early Æolian and Ionian traders. As early as the seventh century B.C. the Milesians had founded Sinope (see SINUB), and that city and Miletus planted a number of settlements along the Pontic coast, of which the most famous was Trapezus (Trebizond); others were Amisus (Samsun), Cotyora, and Cerasus (near the later Pharnacia). In the interior were native cities which later attained prominence, such as Amasia, the old capital and burial place of the earlier kings; Comana Pontica, the chief seat of the worship of the Asiatic goddess Ma; and Cabira or Neocæsarea, the modern Niksar. Some of the earlier satraps or local princes appear to have assumed a royal title in the fourth century B.C., or at any rate were regarded as the founders of the dynasty; but the foundation of the Kingdom of Pontus was really laid by Mithridates III Ctistes (or founder), who in 302 B.C. fled to this region from Antigonus. At first little more than a robber chief, he so skillfully used the disturbances of this time that in 280 B.C. he could assume the title of king. He appears to have died about 266 B.C., master of Paphlagonia and northern Cappadocia, though Sinope was still independent. He was succeeded by his son, Ariobarzanes III, who was followed by Mithridates IV, and Pharnaces I, who took Sinope and removed the inhabitants of Cotyora and Cerasus to his new city of Pharnacia. But he was forced by the Romans to give up most of his Paphlagonian conquests. He was succeeded by Mithridates V. About 121 B.C. the great Mithridates VI Eupator (see MITHRIDATES), one of the most dangerous opponents of Roman rule in the East, ascended the throne. After his overthrow by Pompey (63 B.C.) his kingdom was divided. The portion west of the Halys was joined to the Province of Bithynia. Next to this district the valley of the Iris and the region inland were given to King Deiotarus, and from that time were known as Pontus Galaticus. The eastern region was given to other princes, and later the central portion was given by Antonius to a certain Polemon, whence it was called Pontus Polemoniacus. It was ceded to Rome in the reign of Nero and at first was joined to Galatia. Later both divisions of Pontus were joined to Cappadocia; in the redistricting of the Empire by Constantine Pontus formed two provinces. The narrow eastern strip along the Black Sea was called Pontus Polemoniacus, and the western district, extending to the highlands of Cappadocia, was named Helenopontus. Consult: E. Meyer, *Das Königreich Pontus* (Leipzig, 1879); T. Reinach, *Trois royaumes de l'Asie Mineure* (Paris, 1888); *Mithridate Eupator, roi de Pont* (ib., 1890); W. M. Ramsay, *Historical Geography of Asia Minor* (New York, 1890); Anderson and Cumont, *Studia Pontica* (1903 et seq.); H. Grégoirè, "Voyage dans le Pont," in *Bulletin de correspondance hellenique* (Paris, 1909); De Jerphanion, "Notes de géographie et d'archéologie pontiques," in *Byzantinische Zeitschrift*, vol. xx (Leipzig, 1911).

PONTUS, AQUILA OF. See AQUILA PONTICUS.

PONTUS DE THYARD, tē̇′ȧr′ (1521–1605). A French poet, a member and last survivor of the Pléiade (q.v.). His first book, *Erreurs amoureuses* (1549), was published shortly after the appearance of Du Bellay's *Défense et illustration de la langue française.* His name is connected with the early history of the sonnet. Pontus de Thyard translated *Leo Judæus* and probably had some influence on Platonism. He wrote also *Œuvres poétiques* (1573). His complete work is found in *Collection Pléiade* of Marty-Laveaux (1875).

PONTUS EUXI′NUS. The ancient name of the Black Sea (q.v.).

PONTYPRIDD, pŏnt′ē̇-prĭd′, *Welsh pron.* pŏn′tē̇-prĭth′ (Welsh, bridge of beauty); also called Newbridge. A town in Glamorganshire, Wales, on the Taff, 11 miles southeast of Merthyr Tydfil (Map: Wales, C 5). Its growth and importance are due to its various manufactures, collieries, iron mines, and supplemental industries. Pontypridd is named from the famous bridge built by a self-taught architect over the Taff in 1755. Pop., 1901, 32,316; 1911, 43,211.

PONY (probably from Fr. *poulenet,* dim. of *poulain,* from ML. *pullanus,* foal, colt, from Lat. *pullus,* young animal, chicken; connected with Gk. πῶλος, *pōlos,* foal, and ultimately with Eng. *foal*). A small horse. The name "pony" is commonly applied to the many small active breeds of horse (q.v.) which are to be found throughout the world, more especially in the warmer parts and in mountainous or sterile regions. In general they are exceptionally hardy and possess a strength great in proportion to their size. Possibly the smallest race of ponies is the Shetland, although the Iceland pony differs but little from it and is sufficiently hardy to flourish in the winter of Iceland. The Galloway, Welsh, Dartmoor, Exmoor, and Canadian breeds are types of ponies considerably larger than that of Shetland. Sardinia and Corsica also possess small races of ponies, which have existed unchanged from ancient times.

PONY EXPRESS. The name given to a mail service established between St. Joseph, Mo., and San Francisco, Cal., in 1860. At this time there were three transcontinental mail lines, but the greater part of the mail between the East and the Far West was sent by way of Panama in about 22 days. The demand for a more rapid mail service between the East and the West led to the establishment in the spring of 1860 of the famous "pony express," the mail being carried rapidly overland on horseback under the direction of the Central Overland California and Pike's Peak Express Company. The first pony express left, on April 3, 1860, St. Joseph and San Francisco, between which places the schedule allowed eight days. Stations averaging at first 25 miles apart were established, and each rider was expected to cover 75 miles a day. Eventually there were 190 stations, 200 station keepers, 200 assistant station keepers, 80 riders (who were paid from $100 to $125 per month), and between 400 and 500 horses. The quickest trip was that made for the delivery of President Lincoln's inaugural address, the distance, between St. Joseph, Mo., and Sacramento, Cal., about 1400 miles, being covered in 7 days and 17 hours. At first the company charged $5 for each half ounce, but later the charge was reduced to $2.50. The regular pony-express service was discontinued on the completion of the line of the Pacific Telegraph Company, in October, 1861. The service was often interrupted by Indian hostilities and was extremely hazardous for riders and for station keepers alike. Consult an article in the *Century Magazine,* vol. xxxiv (New York, 1898).

PONZA (pŏ̇n′tsȧ), or **PON′TINE, ISLANDS.** A group of small islands, of volcanic origin, belonging to Italy, situated west of Naples, in the Mediterranean Sea, in about long. 13° E. (Map: Italy, D 4). There are in fact two groups. The western and larger belongs to the Province of Caserta, the eastern to the Province of Naples. They are used as penal settlements. To the former collection belongs Ponza, the largest island, with 4901 inhabitants in 1911. The latter group consists of two islands. The islands served the Roman emperors as a place of banishment.

POOD (Russ. *pudŭ,* from Lat. *pondus,* weight). A Russian weight equal to 40 Russian pounds or 36.1128 pounds avoirdupois.

POODLE (Ger. *Pudel,* from Ger. *pudeln,* to splash in water; connected with LG. *pudeln, puddeln,* to waddle, Eng. *puddle,* pudgy person). A breed of long-haired domestic dogs now kept chiefly as pets. The poodle has long been known and appreciated; his quaintly clipped and shaven body is found depicted on Roman sculptures. From Italy he was introduced into Spain and France and thence into England. He is not only naturally a good retriever or water dog, but has the nose and the sudden stop of both the pointer and setter; indeed, so keen is his nose that even the inferior kinds, or patched dogs, are employed by the poor natives of Hampshire and Wiltshire in England to hunt for and point out truffles. His remarkable general intelligence is indicated by his predominance in all bands of trick and performing dogs. Three varieties are recognized—the red, the white, and the black; and two classes of covering—corded and curly. Their weight is divided, for competitive purposes, into three grades: large size, more than 40 pounds; medium, 20 to 40 pounds; small, 20 pounds or less—the last grade are sometimes called barbets. The general appearance is that of a strong, active, playful, and intelligent dog, well built, and covered with thick, close curls of a silky texture, or with strong, hanging, ropelike cords, sometimes measuring 25 inches, as in the case of the champion Nero. The poodle has a long, capacious skull, the parts over the eyes well arched; good, level teeth; a strong neck; muscular, straight forelegs and hind legs with hocks well let down; strong, well-proportioned and well-padded feet; and a tail carried well up. The ears are long, well set, and lie close to the cheek; and the eyes are black and vivacious. The little white-coated, short-haired, curly poodle, with whose covering the least liberties have been taken, is the widest known of the three varieties, although not the most popular on the show bench. These are essentially family pets, and their quizzical whiskered faces are in evidence in every country from California round the world eastward to China, where this breed is still used in his ancient hunting capacity as a water dog. See Plate of Dogs.

Poodles are usually clipped over the larger part of the body, leaving the cords or curls here and there, after a pattern dictated by the caprice of his master.

POOL. See Billiards.

POOL, The. The upper portion of the harbor of London; the part of the Thames just below

London Bridge, which forms the limit of navigation for seagoing vessels.

POOL, Maria Louise (1845–98). An American writer, born in Rockland, Mass. She removed to Brooklyn, N. Y., in 1870, where she wrote first for a Philadelphia paper and afterward for the *Evening Post* and the *Tribune* of New York. Later she resided in Wrentham, Mass. It was not until 1887 that she became widely known through her *A Vacation in a Buggy*. Her literary work, which consists of sketches, chiefly of New England life, most of which appeared in the periodicals, was issued in book form as follows: *Tenting at Stony Beach* (1888); *Dolly* (1891); *Roweny in Boston* (1892); *Mrs. Keats Bradford* (1892); *Katharine North* (1893); *The Two Salomes* (1893); *Out of Step* (1894); *Against Human Nature* (1895); *Mrs. Gerald* (1896); *In the First Person* (1898); *Boss and Other Dogs* (1898); *A Golden Sorrow* (1898); *The Malvon Farm* (1899).

POOLE. The chief seaport of Dorsetshire, England, on the east coast of the county, 5 miles west of Bournemouth (Map: England, E 6). Its harbor is tidal and has a quayage of 2000 feet. Poole is an ancient town and a municipal county. The town owns much corporate property, has built an esplanade and shore drive, carried out harbor improvements, and established a free library. It has manufactures of sailcloth, tiles, ropes, etc., and a considerable coasting trade, and exports Purbeck clay and grain. The town is named after the pool or bay on which it stands and which at high tide covers an area 7 miles long by 4½ broad. Pop., 1901, 19,500; 1911, 38,886.

POOLE, or **POLE,** Matthew (1624–79). An English biblical scholar, born in York and educated at Emmanuel College, Cambridge (B.A., 1649). He became rector of St. Michael-le-Querne, London. A stanch Presbyterian, he resigned his living on the passage of the Uniformity Act (1662). Having a small but independent income, he now devoted himself to his great undertaking, the writing of *Synopsis Criticorum Aliorumque Sacræ Scripturæ Interpretum* (5 vols., 1669–76). This is a summary of the critical labors of Rabbinic and Roman Catholic commentators, but contains little from Calvin and nothing from Luther. Poole began also a synopsis in English, called *Annotations upon the Holy Bible*. Two volumes appeared in 1683–85, and the work was continued by others (last ed., 3 vols., 1840). Frightened by the Popish plot—for Titus Oates (q.v.), on account of Poole's tract on the *Nullity of the Romish Faith*, had represented him as marked for assassination (1678)—Poole left England and passed his last years at Amsterdam.

POOLE, Paul Falconer (1806–79). An English historical and genre painter. He was born at Bristol and was almost entirely self-taught. First attracting attention in 1843, with a historical painting, "Solomon Eagle Exhorting the People to Repentance," he soon gained great popularity and, after Watts, was for many years the first English painter of imaginary subjects. Though a poor technician, he possessed dramatic and inventive ability. Among his best-known paintings are "The Vision of Ezekiel," Tate Gallery; "Last Scene in King Lear," South Kensington Museum; "The Goths in Italy," Manchester Gallery; "The Dragon's Cavern" (1877); "The Lion in the Path" (1873); and a number of idyllic subjects. He became a member of the Royal Academy in 1861.

POOLE, Reginald Lane (1857–). An English historian, born in London and educated at Balliol and Wadham colleges, Oxford, and at Leipzig. In 1880 he became assistant in the department of manuscripts in the British Museum. Of the *English Historical Review* he was assistant, joint, and then sole editor. He was lecturer in modern history at Jesus College, Oxford, from 1886 to 1910; lecturer on diplomatics in the University after 1896; and became fellow of Magdalen College (1898), keeper of the archives (1909), and curator of the Bodleian Library (1914). He also lectured at Cambridge. Poole wrote, notably: *The Huguenots of the Dispersion* (1880); *Sebastian Bach* (1882); *Illustrations of the History of Mediæval Thought* (1884); *Wycliffe and Movements for Reform* (1889); *The Exchequer in the Twelfth Century* (1912); *On the History of the University Archives* (1912); and reports on historical manuscripts on ecclesiastical muniments (1895–1914). He edited, among other works, *Historical Atlas of Modern Europe* (1897–1902) and, with W. Hunt, *Political History of England* (12 vols., 1905–10). For his brother, see Lane-Poole, Stanley; for his uncle, Poole, Reginald Stuart; and for his great-uncle, Lane, Edward William.

POOLE, Reginald Stuart (1832–95). An English archæologist, born in London. He was educated in Cairo, Egypt, by his uncle, Edward William Lane (q.v.), and became assistant in the department of antiquities in the British Museum in 1852, but was soon transferred to the department of coins and medals, of which he was keeper from 1870 to 1893. He assisted Amelia B. Edwards (q.v.) in establishing the Egyptian Exploration Fund, lectured at the Royal Academy schools in 1883–85, and in 1889–94 was professor of archæology in University College, London. He wrote much concerning Greek and Oriental coins during his connection with the British Museum, contributed to Smith's *Bible Dictionary*, and wrote the descriptive parts of Firth's *Views in Egypt*.

POOLE, Stanley Lane-. See Lane-Poole.

POOLE, William Frederick (1821–94). An American librarian. He was born in Salem, Mass., and graduated at Yale in 1849. While at college he was librarian of the Brothers in Unity Society library, and in his junior year compiled the first edition of his *Index to Periodicals*. He was librarian of the Boston Mercantile Library (1852–56); then became librarian of the Athenæum, where he remained 13 years, becoming well known as one of the leading librarians of the country. He had charge of the Cincinnati Public Library in 1869–73, of the Chicago Public Library in 1873–87, and of the Newberry Library, Chicago, from 1887 till his death. Dr. Poole is most widely known for his admirable *Index to Periodical Literature*, of which he published enlarged editions in 1853 and in 1882. A later edition and several supplements have been compiled by the coöperation of many American librarians, and other volumes have been edited by W. J. Fletcher, librarian of Amherst College. Dr. Poole was much interested in the study of American history. In 1885–87 he was president of the American Library Association and in 1887 president of the American Historical Association. His writings include: *The Battle of the Dictionaries* (1856); *Websterian Orthography* (1857); *Cotton Mather and Salem Witchcraft* (1869); *Anti-Slavery Opinions before 1800* (1887). He organized the Bronson Library at Waterbury, Conn. (1869); the Athenæum Library at St. Johnsbury, Vt.; and the library of the United States Naval Academy.

POOLING (from *pool*, from Fr. *poule*, pool, stakes, hen, from ML. *pulla*, hen, from Lat. *pullus*, young animal, chicken). A division of business or of the proceeds of business among otherwise competing carrier or other parties, intended to minimize the effects of competition by maintaining rates. Pools may be divided into four classes. A division of traffic may be either (1) a division of the field, where the business of a particular territory is assigned to each competitor, or (2) a tonnage pool, where a certain percentage of the competitive business is assigned to each. A division of revenue may be either a (3) gross or (4) net money pool, according to whether it is based upon gross or net receipts. A net money pool almost necessary involves a system of joint accounting, and is therefore a close form of combination.

Railway pooling became a matter of importance in England about 1850, but its origin is obscure. The first railway pools in the United States were probably among the New England railways, but it was in the West that pooling first became a matter of public importance. Both freight and passenger traffic between Chicago and Omaha were pooled in 1870, and the arrangements remained in force, with but one short interruption, for 17 years, the pool being merged in 1884 in the Western Freight Association. The principal roads carrying anthracite coal to the Atlantic seaboard, which also owned about 75 per cent of the anthracite coal fields, had an effective pooling arrangement from 1872 until 1876. In 1873 the roads from Atlanta to the coast formed a pool out of which afterward grew the strong Southern Railway and Steamship Association. The lines from Chicago and Milwaukee to St. Paul arranged a money pool for both freight and passenger traffic in 1874. During the next few years numerous pools were organized, until they covered nearly every part of the country.

Railway freight pooling was forbidden and made a misdemeanor by the Interstate Commerce Act passed in 1887, but the wisdom of this prohibition was, and has continued to be, a much mooted question. (See RAILWAYS.) Most students of the subject, both from a practical and theoretical point, favor the legalization of pooling under government supervision. Pooling prevents discrimination and is conducive to stability of rates, which is generally considered more important than absolute lower rates. It is argued that when the division of competitive traffic is as certain as that of noncompetitive traffic both will be treated without discrimination, for there will be no reason for favoring competitive points; through traffic will then be made to bear its just share of the cost of transportation.

Upon the passage of the Interstate Commerce Act existing pooling contracts were annulled, but the attempt to prevent pooling has not been altogether successful. Traffic associations have endeavored to continue the division of traffic without resorting to the usual pooling machinery. There is abundant evidence of a physical division of cotton freight from Memphis and other interior points to the seaboard; indeed, this pool has been sustained by the Supreme Court of Tennessee. It does not fix rates, but all the roads concerned accept the lowest rate to Liverpool prevailing on any given day. There is said to be a somewhat similar division of the fruit traffic from southern California. The so-called Buffalo grain pool, which was investigated by the Interstate Commerce Commission in 1900, was intended to divide the grain traffic from Buffalo to New York and to maintain a rate of four cents a bushel.

At common law the American courts have usually held pooling agreements to be contracts in restraint of trade and against public policy. Pools have therefore been extralegal agreements not enforceable by the courts, but dependent upon the good faith of the parties, and hence lacking in permanence. In England the courts look upon pooling with much less disfavor than in the United States; while on the Continent pooling is regarded with such favor that the government railways of Prussia, Austria, and other countries maintain pooling arrangements with competing water routes.

Pooling is not confined to transportation lines. The Western Elevating Association is an organization of grain elevators at Buffalo which establishes uniform rates for elevating and storing grain, collects the earnings, and, after deducting expenses, distributes the remainder to the participating elevators in certain specified proportions based upon their working capacity and the business they control. Manufacturing concerns sometimes form pools for the purpose of keeping up prices by limiting production.

The term "pool," or "pooling," is applied also to various other forms of combination for concerted action. In a Wall Street or stock pool stockholders of a company assign their stock to a firm of bankers or brokers, to be sold within a given time, usually at not less than a stated price, otherwise the stock is to be returned to the holders, the profits, if any, being shared by all alike. Receivers of farm produce in the Cincinnati market have formed pools for economy in handling the goods, fewer salesmen being required by this method.

Consult: Cooley, *Popular and Legal Views of Traffic Pooling* (Chicago, 1884); Hadley, *Railroad Transportation* (New York, 1885); Hadley, "Prohibition of Railway Pools," in *Quarterly Journal of Economics* (1890); H. T. Newcomb, *Railway Economies* (Philadelphia, 1898); W. Z. Ripley, *Trusts, Pools, and Corporations* (Boston, 1905); also *Reports of the United States Industrial Commission* (Washington).

POOL SELLING. A method of gambling by the distribution of chances in a common pool, or combination of stakes, on some uncertain event, as a horse race. For example, in a pool on a horse race each better pays in a certain amount, naming the horse he desires to back and receiving a ticket as a receipt, and on the determination of the race the winner is paid the total amount wagered by all the betters on the race, less a commission, usually 10 per cent, which is retained by the manager or person selling the pools. The term is also sometimes inaccurately applied to the method of betting with bookmakers in places at a distance from the race track. Pool selling and the keeping of pool rooms are prohibited by statute in most of the United States. See GAMBLING.

POONA, pōō′nȧ, officially PUNA. The capital of a district in Bombay, British India, on the river Mutha, near its confluence with the Mula, on an almost treeless plateau, about 74 miles southeast of Bombay (Map: India, B 5). Poona is about 1700 feet above the sea level; its climate is healthful and pleasant, and it is very much resorted to, particularly in the rainy season. The city, the former capital of the Mahrattas, is divided into seven quarters, named after the days of the week, and contains the ruins of a palatial structure formerly the residence of the peshwa. It is the headquarters of the Bombay army and the seat of the Bombay government from July to November. The Deccan College, founded in 1821, has a staff of European professors with native assistants, providing higher instruction in the liberal arts and in law in connection with Bombay University. There are numerous other educational institutions, including the Government College of Science, the Maharasthra College, and the Fergusson College. One of the most interesting objects in the neighborhood of Poona is a large *bund*, or embankment, solidly built of hewn stone over the Mutha-Mula River for the purpose of providing a supply of water for the cantonment, and especially the bazar or native town connected with it. Poona was formerly a great mart for jewelry and precious stones, but this trade has quite ceased. The native manufactures also have been supplanted by the introduction of European piece goods, and the principal commerce is in connection with grain and other agricultural produce. Poona suffered severely from the plague, and from 161,390 in 1891 its population decreased to 111,385 in 1901, but advanced again to 158,856 in 1911. Poona is first mentioned in the sixteenth century. It became the Mahrattan capital in 1750; it was captured and destroyed by Nizam Ali in 1763, and later in the same year the combined forces of the peshwa and Sindia were completely defeated here.

POONA WOOD (Kanarese *ponne*). The timber of the poon trees (*Calophyllum inophyllum* and *Calophyllum angustifolium*) of India, commonly used for planks and spars in shipbuilding. See CALOPHYLLUM.

POOP (OF. *poupe, pouppe*, Fr. *poupe*, from Lat. *puppis*, stern of a ship). A light deck, raised above the main or upper deck and extending a short distance forward from the stern. It is all that remains of the old stern castle, which towered above the upper deck in ships of the seventeenth century and of several preceding centuries.

POOR, OVERSEERS OF THE. See OVERSEERS OF THE POOR.

POOR, CHARLES LANE (1866–). An American astronomer, born at Hackensack, N. J. He graduated (1886) from the College of the City of New York and took his degree of Ph.D. at Johns Hopkins (1892), where he taught until 1899, becoming associate professor of astronomy. At Columbia he was lecturer (1903–04), professor of astronomy (1904–10), and thenceforth professor of celestial mechanics. Poor served as editor of the *Annals* of the New York Academy of Sciences in 1901–06, and became president of the Lowe Manufacturing Company in 1905. He is author of *The Solar System* (1908) and *Nautical Science in its Relation to Practical Navigation, together with a Study of the Tides and Tidal Currents* (1910).

POOR, ENOCH (1736–80). An American soldier, born at Andover, Mass. He became a shipbuilder at Exeter, N. H., but in 1775, after the battle of Lexington, was commissioned colonel of one of the three regiments raised by the New Hampshire Assembly. In 1777 he was promoted brigadier general in the Continental army, and had a conspicuous part in the battles of Saratoga, his brigade bearing the brunt of the action on September 19. He distinguished himself at Monmouth also (June 28, 1778), and the next year, during Gen. John Sullivan's campaign against the Indians of the Six Nations, led his troops in a difficult flank movement which resulted in the decisive victory at Newtown, the present Elmira (Aug. 29, 1779). In 1780 he was transferred to one of Lafayette's two brigades of light infantry at that general's request. Soon afterward he died, while stationed at Hackensack, N. J.; here a monument was erected to his memory.

POOR, HENRY WILLIAM (1844–1915). An American banker and expert on railroads, born at Bangor, Me. He graduated from Harvard in 1865 and in 1868, the year that he entered the brokerage business with his father under the firm name of H. V. and H. W. Poor, he issued the first number of his valuable annual, *Poor's Manual of Railroads*. He became a member of the New York Stock Exchange in 1890, director of the United States Casualty Company, and senior member of the H. W. Poor banking house of New York and Boston.

POOR, THE (OF. *poure, pouvere, povre*, Fr. *pauvre*, from Lat. *pauper*, poor). The term used to designate those for whom it is a struggle to procure the necessaries of life. In law it has reference to those who are wholly or in part dependent on public support. See MENDICANCY; PAUPERISM; VAGRANT.

POOR CLARES. See CLARES, POOR.

POORE, BENJAMIN PERLEY (1820–87). An American journalist, born near Newburyport, Mass. His father sent him to a military school to prepare for admission to West Point, but he ran away and apprenticed himself to a printer. At the expiration of his service his father bought for him the *Southern Whig*, an Athens, Ga., newspaper. After only two years as editor, however, he accepted an appointment as attaché to the American Legation in Brussels. During the seven years following he visited the principal countries of Europe, Egypt, and Palestine, and acted as foreign correspondent of the Boston *Atlas*. During the last four years he acted also as historical agent for Massachusetts in France, copying from the French archives many papers of historical value and illustrating them with maps and sketches. After his return to America in 1848 he edited the Boston *Bee* and *Sunday Sentinel*, and in 1854 became the Washington correspondent of several newspapers. For a short time during the Civil War he served as major of the Eighth Massachusetts Volunteers, but soon returned to his journalistic work, at which he continued until 1884. During these years he was for a long period clerk of the Senate Committee on Printing Records, and in this capacity compiled and edited several publications dealing with the government, including *The Conspiracy Trial for the Murder of the President* (1865); a *Descriptive Catalogue of the Government Publications of the United States, 1774–1881* (1885); *The Political Register and Congressional Directory* (1887). In addition he published, among other works: *Rise and Fall of Louis Philippe* (1848); *Life of General Zachary Taylor* (1848); *The Life and Public Services of Ambrose E. Burnside* (1882); *Perley's Reminiscences of Sixty Years in the National Metropolis* (2 vols., 1886). But Poore is best known for his invaluable compilation called *Federal and State Constitutions, Colonial Charters, and Other Organic Laws of the United States* (2 vols., 1877).

POORE, HENRY RANKIN (1859–). An American figure, animal, and landscape painter, born in Newark, N. J. He was a pupil of the National Academy of Design in New York, and of the Pennsylvania Academy, under Peter Moran, and afterward studied in Paris with Luminais and Bouguereau. At first he made a specialty of a combination of figure and animal subjects, particularly dogs, but later devoted more attention to pure landscape, preferably the subdued and melancholy aspects of New England scenery. His composition is vigorous, his color pleasing though lacking brilliancy, and his treatment sympathetic. Among his works are "The Ploughing of the Ephrata Brethren" (1894); "Hounds in Winter" (1898); "Clearing Land" (1903); "The Long Day" (1914); "Pilgrim Sons" (1915). He is represented in the Buffalo Academy, the St. Louis Museum, and the Art Association, Indianapolis. His publications include *Pictorial Composition and the Critical Judgment of Pictures* (1903; 7th ed., 1913), a valuable book for students and professionals, the fruit of several years' teaching, and *The New Tendency in Art* (1913). He became an associate of the National Academy of Design and received the $2000 annual prize of the American Art Association in 1889 and a gold medal at Buenos Aires (1910).

POORE, SIR RICHARD (1853–). A British admiral, who, as fourth Baronet, succeeded his father in 1893. He served with the Perak expedition of 1875–76, at Alexandria in 1882, and in the Khartum expedition in 1884–85; became rear admiral in 1903; commanded the Channel fleet in 1904–05; and was vice admiral in 1907, commander in chief of the Australian station in 1908–11, admiral in 1911, and then commander in chief at the Nore.

POOR LAWS. The laws regulating the public relief of the poor. Charities may be provided in two ways—by private initiative, as in the case of the Friendly Societies in England, or directly by the state. This latter relief is of many kinds, including the almshouse for those permanently indigent or disabled, the workhouse in case of confirmed mendicancy, and temporary outdoor aid for the casual poor. There appears to be a growing inclination on the part of the nations to make poor relief a public obligation, either by directly assuming the responsibility or by more closely regulating private efforts. There has also been a steady movement in the last 75 years towards limiting the amount and scope of relief to the poor. The English legislation of 1834 and subsequent years, which virtually abolished outdoor relief and threw the support of bastard children on the mother, strongly marks this tendency. For an extended discussion of the history of the poor laws in various countries, see PAUPERISM.

POOR RATE. The name of the tax raised in England for the maintenance of the public poor relief. The first tax levied for this purpose was in 1573. The assessment and collection were in charge of the overseers of the poor (q.v.). The earlier levies seem to have been on the basis of the number of acres owned, but later degrees of value were recognized. The overseers were made subject to the courts and their assessment had to be countersigned by two justices. Great inequalities arose in the different parishes, and no fixed basis of assessment was reached until 1836, when the Parochial Assessment Act (6 and 7 Wm. IV) established the principle that the "net rent is the standard of ratable value." This Act was permissive only, but in 1845 the justices were empowered to appoint an assessment committee for the purpose of determining the county rate. Owing to the varying contributions of the different parishes, the Law of 1861 (24 and 25 Vict., c. 55) made the share of each parish to accord with its ratable value, and in 1862 the Union Assessment Committee Act was passed. This required the guardians to appoint a committee, to which the overseers of each parish submit their lists of property. These lists are made public, and property owners are given a chance to appear and to appeal. The list given out by this committee becomes the basis for levying the rate. In 1867 a special act was passed to meet conditions in London. Originally rates were levied upon personal as well as real property, but the liability of personal property was abolished by 3 and 4 Vict., c. 89. Consult George Nicholls, *History of the English Poor Law* (new ed., 3 vols., London, 1899). See PAUPERISM; POOR LAWS.

POOR RICHARD'S ALMANAC. A popular almanac published by Benjamin Franklin in 1732 and continued for 25 years. As "Richard Saunders" Franklin supplied in his almanacs, of which 10,000 were sold yearly, a fund of proverbs, homely wisdom, and common sense of the greatest practical value.

POOR ROBIN. The assumed name of the author of an almanac, first issued in 1662 and continued until 1776. It was ascribed wrongly to Robert Herrick and is supposed to be the work of William Winstanley. Throughout the seventeenth century a number of publications were issued under the name of Poor Robin, the most popular of which was *Poor Robin's Jests* (1667).

POORTEN-SCHWARTZ, pōr′ten-shvärts, JOOST MARIUS WILLEM. See MAARTENS, MAARTEN.

POOR′WILL′. A small nightjar (*Phalænoptilus nuttallii*) abundant on the Western plains of the United States, named from its two-syllabled characteristic note. The plumage is peculiarly soft and bronzelike or silver gray. The poorwill lays white, unspotted eggs. Compare WHIPPOORWILL.

POPAYÁN, pō′pȧ-yän′. Capital of the Department of Cauca, Colombia. It is situated near the banks of the river Cauca, 225 miles southwest of Bogotá, in a wide and beautiful plain 6000 feet above the sea and dominated by the volcano of Puracé (Map: Colombia, B 3). The principal buildings are the cathedral and the archiepiscopal palace. It has a university, seminaries, and a normal school, and manufactures woolen blankets and other articles for home consumption. Pop., 1912, 18,724. Popayán was founded in 1536 by Belalcazar. In the eighteenth century it was an important commercial and gold-mining centre, and a mint was established there in 1748. It suffered much in the civil wars and is now in decay.

POP CORN. See MAIZE.

POPE. See PAPACY.

POPE, TEMPORAL POWER OF THE. See TEMPORAL POWER OF THE POPE.

POPE, ALBERT AUGUSTUS (1843–1909). An American manufacturer, born at Brookline, Mass. At the beginning of the Civil War he enlisted in the Thirty-fifth Massachusetts Infantry and at its close was brevetted lieutenant colonel. He then engaged in selling shoe manufacturers' supplies and in 1877 founded the Pope Manufacturing Company, which made small patented articles. It was in this year that Pope first imported bicycles, and in 1878 he began to manufacture them himself, being the American pioneer in the industry. During the tremendous popularity of bicycling Pope made a fortune, but later, when he tried to manufacture automobiles in response to the change in public favor, he was not so successful; indeed his company went into the hands of a receiver in 1907. He was particularly active in the movement for better roads.

POPE, ALEXANDER (1688–1744). An English poet, born in London, May 21, 1688. His father, a linen draper, withdrew from business about 1700 and settled at Binfield, in Windsor Forest; in 1716 he moved to Chiswick on the Thames, near London. The poet's mother was Edith Turner, who belonged to a Yorkshire family. The elder Pope was a Roman Catholic, and to this faith the poet also nominally adhered, thus debarring himself from a university career. He learned to read from an old aunt and received some education in two Catholic schools as well as from private tutors (Roman Catholic priests), but for the most part he taught himself. He read widely in English poetry and studied French, Italian, Latin, and Greek. Thus left to himself, he never became an accurate scholar. Soon after the death of his father (1717) he leased (1719) a house and five acres of land at Twickenham, on the banks of the Thames, whither he withdrew with his mother, to whom he was tenderly attached, and there he dwelt till his death. In the famous villa Pope was visited by the most celebrated wits, statesmen, and beauties of the day. He died May 30, 1744. In his tenth year Pope was stricken by an illness which distorted his frame and robbed him of his plumpness and his color. His physical infirmity, susceptible temperament, and incessant study rendered his life "one long disease." He was, Lord Chesterfield said, "the most irritable of all the *genus irritabile vatum,* offended with trifles, and never forgetting or forgiving them." Of his many quarrels that with Addison was least justifiable. Yet when no disturbing jealousy, vanity, or rivalry intervened, Pope was generous and affectionate, as witness the long friendship with Arbuthnot, Gay, and Swift, and his devotion to his mother.

Pope was the most precocious of English poets. About 1702 he made a translation of the first book of the *Thebaïs* of Statius (not published till 1712), and about the same time he wrote an epic called *Alexander,* which he burned about 1717. By 1706 he had composed his *Pastorals,* which were first published in Tonson's *Miscellanies* in 1709. The smooth and melodious verses at once made Pope known. The experiment in the pastoral was followed by the *Essay on Criticism* (1711), which expounded the canons of taste; the *Messiah* (1712); *Windsor Forest* (1713), a descriptive poem, less artificial than the *Pastorals;* and the *Rape of the Lock* (first draft, 1712; altered and enlarged in 1714), the most graceful, airy, and fanciful of Pope's poems. In 1714 appeared *The Wife of Bath,* imitated from Chaucer, from whom he also got *The Temple of Fame.* In 1717 Pope published a collection of his works, where first appeared the *Epistle of Eloisa to Abelard* and the *Elegy on an Unfortunate Lady,* his most noteworthy lyrics. Pope was already engaged on the work that was to give him solid fame. His translation of the *Iliad* was published in six volumes (1715–20). Out of the profits of this work he purchased and adorned his villa. The translation, though wanting in Homeric simplicity, naturalness, and primitiveness, is nevertheless a fine piece of writing, judged apart from its original. The *Iliad* was followed by the *Odyssey* (1725–26), which was, however, mostly the work of William Broome and Elijah Fenton. Though a pecuniary success, the *Odyssey* added nothing to Pope's fame. Pope now made his famous attack on Grub Street. The *Dunciad* was finished by 1727; but before publishing it Pope stirred up his enemies with "Bathos, or the Art of Sinking in Poetry," in the *Miscellanies* (March, 1728), written in conjunction with Swift and Arbuthnot. The *Dunciad,* in three books, first appeared May 28, 1728, and was enlarged the next year. Pope took as his supreme dunce Lewis Theobald (q.v.), who had criticized an edition of Shakespeare that Pope had brought out in 1725. Around Theobald gyrated the other dunces. In 1742 Pope added a fourth book, dethroned Theobald and put Colley Cibber (q.v.) in his place. This long lampoon, though mean in spirit, is brilliant in style. Pope closed his poetical career with the *Moral Essays* (1731–38) and a group of satires called *Imitations of Horace* (1733–38). The former group contains the famous *Essay on Man* (1733), a philosophical poem, in which is expounded the deism of Bolingbroke, taken back in the sequel, the *Universal Prayer* (1738). To the latter group belongs the delightful *Epistle to Dr. Arbuthnot* (1735).

Pope has been variously estimated. To his generation he seemed the greatest of English poets. This position was questioned by Joseph Warton, who, in his *Essay on the Genius and Writings of Pope* (vol. i, 1751), placed Pope below Spenser. And the later romantics, who laid the stress on the matter of poetry rather than on its technique, had doubts as to whether Pope was a poet at all. On his rank a memorable controversy was started by W. L. Bowles in 1806. If, in the language of Wordsworth, "poetry is the breath and finer spirit of all knowledge," uttered in impassioned language, there is little poetry in Pope. He was hardly successful in *Eloisa* and the *Unfortunate Lady,* his two experiments in pathos. They are only the rhetoric of emotion. Likewise the *Rape of the Lock* is a poem of the fancy rather than of the imagination. Without deep feeling or great imagination, Pope yet possessed rare excellences. In execution he could be faultless. He evoked the melodies of the heroic couplet and molded it to the expression of keen wit and epigram. His proverbial philosophy, so often quoted—as "A little learning is a dang'rous thing"—is likely to be false or only half true, for Pope himself was no thinker; but in the realm of satire, as represented by the *Imitations of Horace,* he is still in the first rank of English poets.

Bibliography. Collective editions of Pope's

Works have been edited by W. Warburton (9 vols., 1751), Joseph Warton (1797), W. L. Bowles (10 vols., 1806), W. Roscoe (1824), and by Croker, Elwin, and Courthope (10 vols., London, 1871–98), the standard edition. Consult also: Abbott, *Concordance to Pope's Works* (ib., 1875); Leslie Stephen, *Alexander Pope, 1688–1744*, in "English Men of Letters Series" (ib., 1880); John Dennis, *The Age of Pope, 1700–1744* (ib., 1894); E. M. Symonds, *Mr. Pope: His Life and Times* (New York, 1909); G. K. Chesterton, in *Varied Types* (ib., 1903). For poems alone, consult the convenient Globe edition (New York, 1869), the edition with memoir of Pope by John Dennis (London, 1891), and the Cambridge edition by H. W. Boynton (Boston, 1903).

POPE, Alexander (1763–1835). An Irish actor and artist, born in Cork. Between 1787 and 1821 he exhibited 59 miniatures at the Royal Academy. In 1785 he appeared at Covent Garden, London, playing the part of Oroonoko (in Mrs. Aphra Behn's famous tragedy of that name), and continued to act at that theatre, for the most part, until 1808. Subsequently he played at the Haymarket and Drury Lane and also in Edinburgh. Pope excelled in tragic parts, particularly in that of Othello.

POPE, Charles A. (1818–70). An American surgeon, born at Huntsville, Ala. He studied at the Cincinnati Medical College and at the University of Pennsylvania (M.D., 1832), and at St. Louis University was professor of anatomy and physiology (1843–47) and of surgery (1847–53), and dean (1848–53). He was professor of surgery at the St. Louis Medical College (Washington University) from its foundation in 1853 to 1867. In 1854 he served as president of the American Medical Association. Pope spent considerable time in Paris in 1839–40, 1846, and 1864, and in 1867 settled there.

POPE, Franklin Leonard (1840–95). An American electrical engineer, born at Great Barrington, Mass. In the employ of the Russo-American Telegraph Company (1864) Pope made surveys in the region between British Columbia and Alaska. When this project failed he went to New York, formed a partnership in 1867 with Thomas A. Edison, with whom he invented (1870) the stock ticker and (1872) the rail circuit for automatic control of block signals. An able patent solicitor, he was for some time attorney to the Western Union Telegraph Company. He was killed in his own house in Great Barrington, Mass., by an electric shock received from a powerful transformer. In 1886–87 he was president of the American Institute of Electrical Engineers. Pope edited the *Electrical Engineer* (1884–95) and wrote *Modern Practice of the Electric Telegraph* (1871; 15th ed., rev., 1892) and *Life and Work of Joseph Henry* (1879).

POPE, John (1822–92). An American soldier. He was born at Louisville, Ky., March 16, 1822, and was the son of Nathaniel Pope, who for many years was United States judge for the District of Illinois. He graduated at West Point in 1842. After graduation he served as brevet second lieutenant in the topographical engineers and in 1846 joined General Taylor in Mexico. He was brevetted first lieutenant for gallantry at the siege of Monterey and captain for services at the battle of Buena Vista. After the close of the war he conducted an expedition which explored the region of the Red River of the North, was on engineering service in New Mexico in 1851–53, and from 1853 to 1859 had charge of the work of surveying a route for the Pacific Railroad. He was commissioned captain in 1856. Upon the beginning of the secession movement Pope came out on the side of the Union and in the winter of 1860–61 delivered a number of Union speeches. For criticizing the policy of President Buchanan in one of these speeches he was summoned to appear before a court-martial, but the trial never took place. In May, 1861, he was appointed a brigadier general and received command of the District of Northern Missouri. In the following December he defeated Gen. Sterling Price at Blackwater, capturing about 1500 prisoners and a large quantity of supplies. He next coöperated with the flotilla of gunboats under Foote in the operations against Island No. 10, which place surrendered in April, 1862, with about 7000 men and 158 cannon. He then took part in the operations against Corinth, after which he was promoted major general of volunteers and brigadier general in the regular army and received command of the Army of Virginia, comprising the corps of Generals Frémont, Banks, and McDowell.

He entered upon the new campaign with a somewhat bombastic proclamation, but after some engagements between portions of his army and the forces of General Jackson, and after he had been reënforced by a large part of the Army of the Potomac, he was badly defeated by Lee and Jackson at the second battle of Bull Run (q.v.), Aug. 29 and 30, 1862, and was forced to retire to the defenses of Washington. He attributed his defeat to the inactivity of the army under McClellan and to the failure of certain officers, particularly of Gen. Fitz-John Porter, to carry out his orders. A court-martial found Porter guilty and dismissed him from the service, but years afterward the decision was reversed. Pope himself asked to be relieved from command; the request was granted, and he was sent to carry on the war against the Sioux Indians. There has been much dispute as to Pope's responsibility for the disastrous outcome of his campaign against Jackson and Lee, but the weight of opinion has on the whole been unfavorable to him. In January, 1865, after the close of the Indian war, Pope was placed in command of the military Division of the Missouri, which was later enlarged into the Department of the Missouri. In 1867–68 he commanded the Third Military District, organized under the Reconstruction Act; in 1868–70, the Department of the Lakes; from 1870 to 1884, the Department of the Missouri; in 1882 was made major general in the regular army; and from 1884 until his retirement in 1886 commanded the Department of the Pacific. Pope died at Sandusky, Ohio, Sept. 23, 1892. He published a report in vol. ii of *Reports of Explorations for a Railroad* (1855) and *The Virginia Campaign* (1863). For an excellent account of his campaign against Lee and Jackson, consult Ropes, *The Army under Pope* (New York, 1881).

POPE, John Henry (1824–89). A Canadian statesman. He was born in the Eastern Townships, Province of Quebec, and was educated at the Compton high school. He entered politics as a Conservative in 1857, and until Confederation (1867) was member for Compton County in the Canada Legislative Assembly. For more than 20 years after Confederation he represented the same county in the House of Commons. He was Minister of Agriculture in 1871–73, during the first Dominion administration of Sir John A. Macdonald, and after the latter's return to power was for the second time Minister of Agriculture (1878–85) and in 1885 became Minister of Railways and Canals. As such he had a prominent share in negotiations for the building of the Canadian Pacific Railway, and in 1880, with Sir John A. Macdonald and Sir Charles Tupper, he went to England to procure British approval and financial support for the undertaking. The contract was made and afterward was confirmed by the Dominion Parliament.

POPE, William Burt (1822–1903). A Methodist theologian, the first to write from the point of view of modern theological science. He was born at Horton, Nova Scotia, was educated at Richmond College, London, was pastor in England in 1841–67, and then became professor of theology at Didsbury College, Manchester. He is the author of *Discourses on the Kingdom and Reign of Christ* (1869); Fernley Lectures on *The Person of Christ* (1875; 3d ed., 1899); *Christian Theology* (2d ed., 3 vols., 1877–80); *The Prayers of St. Paul* (1876); *Sermons and Addresses* (1878); *A Higher Catechism of Theology* (1883). Consult R. W. Moss, *The Life of W. B. Pope, Theologian and Saint* (London, 1912).

POPE, William Jackson (1870–). An English chemist, born in London and educated at the Finsbury and London Central Technical colleges. He was head of the chemistry department in the Goldsmiths' Institute of London (1897–1901) and in the Manchester Municipal School of Technology (1901–08), professor in the University of Manchester, and, after 1908, professor at Cambridge, where he was a fellow of Sydney Sussex College. He made important researches in crystallography and discovered with William Barlow the connection, in relation to valency, of chemical constitution and crystal structure. In 1900 he delivered the Cantor lectures of the Society of Arts, on the relation of geometry to the chemistry of fermentation. In 1915 he was one of the technical experts chosen to aid the Admiralty and the War Office in the "mobilization of invention."

POPE OF GENEVA, The. A popular name given to John Calvin.

POPERINGHE, pŏp′răng′. A town in the Province of West Flanders, Belgium, 6½ miles from Ypres by rail and 4 miles from the French frontier (Map: Belgium, A 4). The town is walled and its thirteenth-century parish church is interesting. Its manufactures, which date from mediæval days, include lace, linens, and woolen cloths. Hops are grown in the district. Pop., 1900, 11,552; 1910, 12,205. During the European War which broke out in 1914 Poperinghe was overrun time and again by the contending armies in the severe fighting around Ypres. See War in Europe.

PO′PERY LAWS. In the stricter sense of the expression, certain legislation in England directed against the asserted authority of the Pope to administer, through his own appointees, the patronage and resources of the English church. The first of these statutes seems to have been enacted in the twenty-fifth year of Edward I. In the reign of Richard II the famous statute of Præmunire (q.v.) was enacted, and from time to time this was supplemented by further legislation. A number of these old laws still stand on the statute books. In a more general sense the expression has come to be applied also to the body of legislation of an extremely drastic character which from the twenty-third year of Elizabeth was directed against the observance and practice of the Roman Catholic faith in England. Many of the disabilities then imposed upon Catholics have been removed by act of Parliament (Catholic Emancipation Bill, April, 1829), but many of them are still nominally in force, though in practice never applied. Consult Blackstone, *Commentaries on the Laws of England* (4th ed., Chicago, 1899), and A. V. Dicey, *The Relation between Law and Public Opinion in England in the Nineteenth Century* (London, 1905).

POP′EYE′. A fish of the North Pacific (*Macrurus cinereus*), one of the grenadiers (q.v.), and so excessively numerous in the depths of Bering Sea that it outnumbers all other fishes there and furnishes an abundance of food for the marine animals of that region.

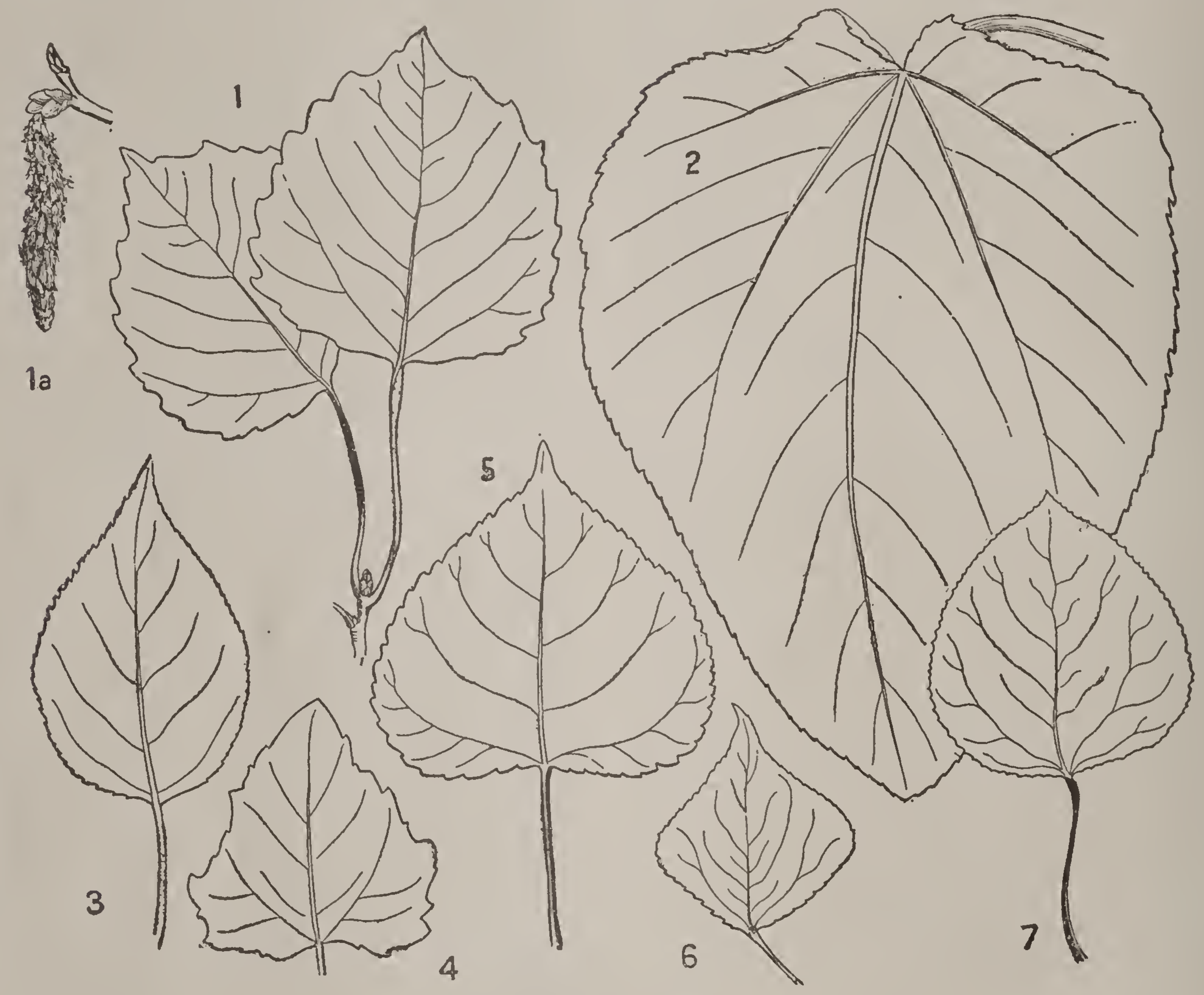
POPHAM, pŏp′am, George (c.1550–1608). An English colonist, born in Somersetshire. As an associate of Sir Ferdinando Gorges in a colonization scheme for a part of Maine, he sailed from Plymouth, England, in 1607, with two ships and about 120 men and, landing in August at the mouth of the Kennebec River, there made the first English settlement in New England, building a storehouse and a fortification which was called Fort St. George. Popham was elected President of the new colony, but died the following year, and the colonists, becoming disheartened by the severity of the climate, returned in the spring to England.

POPHAM, Sir John (c.1531–1607). An English jurist. He was born at Wellington, Somersetshire, studied at Balliol College, Oxford, and in the Middle Temple, and may have been a member of Parliament in Queen Mary's days. He was recorder of Bristol, from 1572 to 1583 was a member of Parliament for that city, and in 1580 was elected Speaker. In 1581–92 he was Attorney-General. In 1592, after conducting many state trials as crown prosecutor, especially those of the Babbington conspiracies, Popham was made Chief Justice and was knighted. A severe judge, he presided at the trial of those implicated in Essex's insurrection, of Sir Walter Raleigh, and of Guy Fawkes. He wrote *Reports and Cases* (1656), a work of small value. He became interested in American colonization, and with Ferdinando Gorges obtained from James I patents for two companies known respectively as the London Company and the Plymouth Company, the patentees being authorized to make settlements in America and to maintain a general government for 21 years. Popham sent out an exploring expedition under Martin Pring, and in the following year the short-lived Popham colony, under his brother, George Popham, was established at the mouth of the Kennebec River in what is now the State of Maine.

POP′INJAY (OF. *popejaye*, *papegai*, *papegau*, *papegaut*, Fr. *papegai*, *papegaut*, parrot, from ML. *papegallus*, from MGk. παπαγάλλος, *papagallos*, παπαγάς, *papagas*, parrot). A name of the green woodpecker (*Picus viridis*), a bird common in most of the wooded districts of England and Scotland. (See Woodpecker.) The name was originally applied to parrots, but is no longer in use in that sense. In the Middle Ages and even later the names *popinjay* in England and *papegai* in France were given to a target made to look like a parrot. The effigy was set on a pole and shot at by archers. The most skillful marksman often received a silver popinjay as a prize. Consult Strutt, *Sports and Pastimes* (London, 1801 et seq.), and Jusserand, *Jeux et sports d'exercise dans l'ancienne France* (Paris, 1901).

POPISH PLOT. See Oates, Titus.

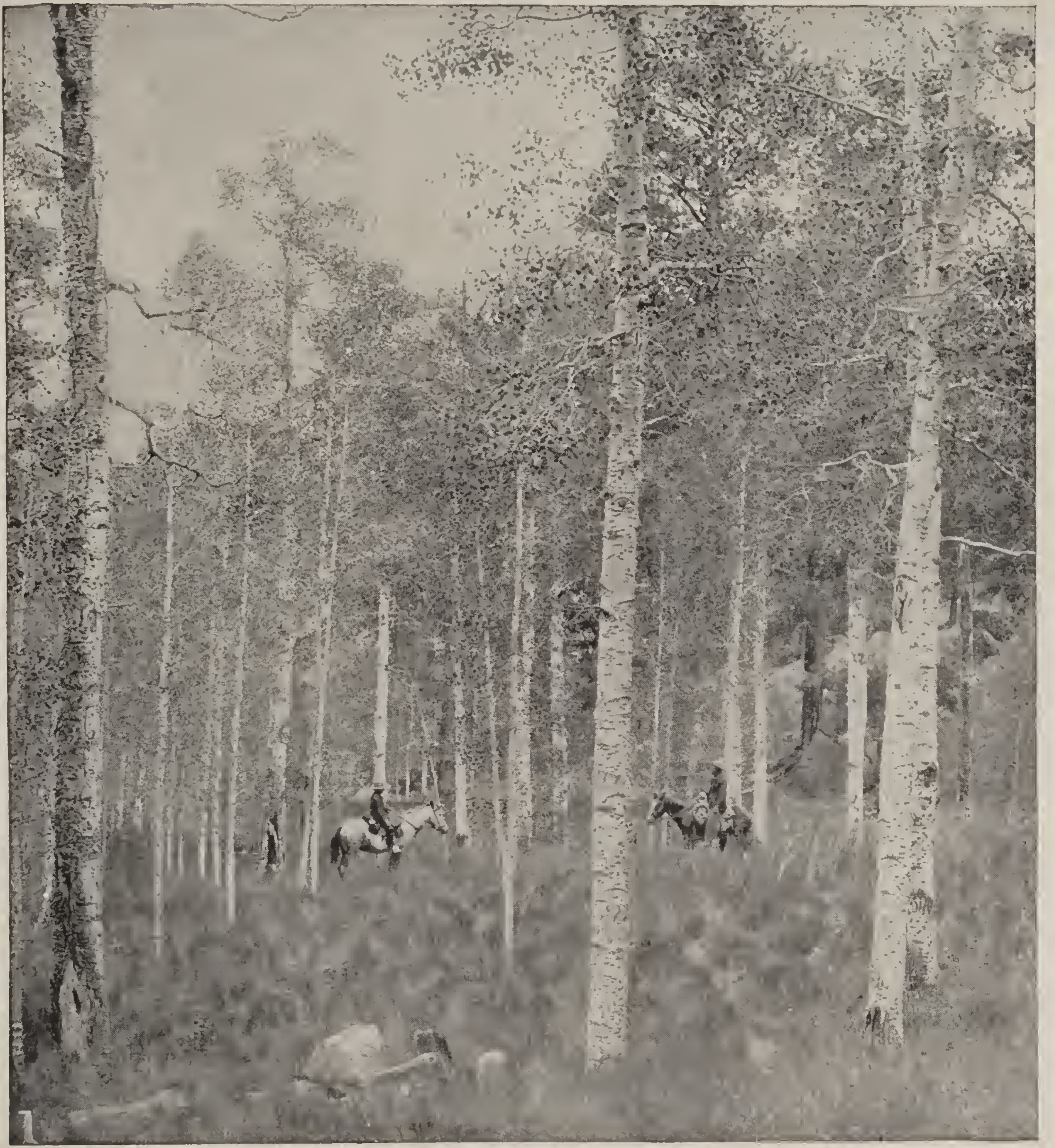
POP'LAR (OF. *poplier*, *peuplier*, Fr. *peuplier*, from *peuple*, poplar, from Lat. *populus*, poplar), *Populus*. A genus of trees, forming with willows the family Salicaceæ. The species number about 20, chiefly natives of the temperate and the cold regions of the Northern Hemisphere, half of them occurring in the United States. They are large trees of rapid growth, with soft wood, and usually have broad, heart-shaped, ovate triangular or lozenge-shaped, deciduous leaves, on rather long stalks. Many of them are beautiful. The catkins appear long before the leaves, and proceed from distinct lateral buds. Few of the poplars are of much value for their timber, which is generally white, soft, and light; but from their rapid growth they are useful as yielding firewood where the scarcity of other fuel renders necessary the planting of trees for this purpose. They are often planted as ornamental trees, since they produce an immediate effect of embellishment in a bare situation more readily than almost any other kind of tree. For windbreaks and shade in the prairie regions of the West they are also popular. The wood is employed extensively in making wood pulp and paper. Besides the species known by the name "aspen" (q.v.), or tremulous poplar, the following appear the most worthy of notice. The white, or silver-leaf, poplar, or abele (*Populus alba*), a native of southern Europe, is 80 feet or upward, with a fine spreading head and roundish, heart-shaped, lobed, and toothed leaves, which are smooth, shining, and dark green above, downy and silvery white beneath. It has been introduced into the United States and has spread from New Brunswick to Pennsylvania. The wood is used by cabinetmakers, turners, and toy makers. It is little liable to swell or shrink, which adapts it to these purposes. The gray poplar, which is a form of *Populus alba*, is very similar to the white poplar, a large, spreading tree with leaves similar to those of the white poplar, but not so dark green above nor so white beneath. It is of less rapid growth than the white poplar, and its wood, which is believed to be harder and better, makes good flooring and is preferable to pine for the neighborhood of fireplaces, being less likely to take fire. It is used also for doors, carts, barrows, etc., and, not being liable to warp, is esteemed by wood carvers. The tree usually begins to rot in the heart when 40 or 50 years old. Like most other poplars, it fills the ground with sprouts. The black poplar (*Populus nigra*), a native of most parts of Europe, is a tree of 50 to 100 feet high, with an ample, spreading head, viscous leaf buds, and deltoid or unequally quadrangular, perfectly smooth leaves. It has been introduced and is well established in the valleys of the Hudson and Delaware rivers and elsewhere. The wood is used for the same purposes as that of the



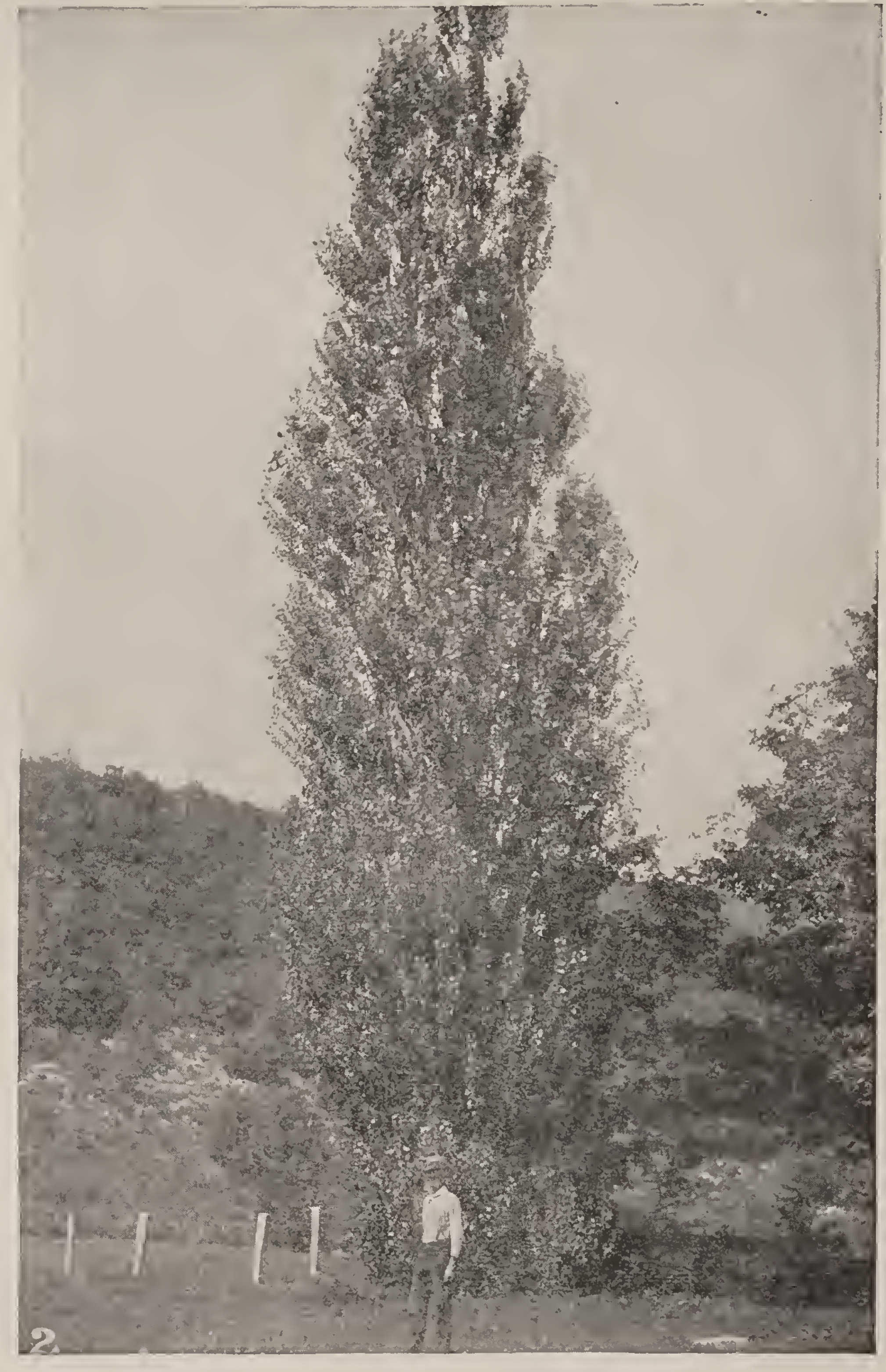
POPLAR LEAVES.

1, large-toothed aspen (*Populus grandidentata*); 1a, ament of above; 2, swamp poplar (*Populus heterophylla*); 3, balsam poplar (*Populus balsamifera*); 4, silver-leaf poplar (*Populus alba*); 5, cottonwood (*Populus deltoides*); 6, Lombardy poplar (*Populus nigra*, var. *italica*); 7, American aspen (*Populus tremuloides*).

POPLARS



1. ASPEN FOREST, ARIZONA (Populus tremuloides).



2. LOMBARDY POPLAR (Populus nigra, var. Italica).

white and the gray poplar. The cotton from the seeds has been used in France and Germany for making cloth hats and paper, but these uses of it were not found profitable. The Lombardy poplar (*Populus nigra*, var. *italica*, sometimes called *Populus fastigiata* and *Populus dilatata*) is a variety of the black poplar, with erect instead of spreading branches, which appears to have been introduced into Europe from the East, is very common in the Punjab and in Persia, and now also in Lombardy and other parts of Italy. It attains a height of 100 or even 150 feet, and is remarkable for its erect form, contracted head, and very rapid growth. It is sometimes planted as an ornamental tree. Owing to extensive planting during the latter part of the eighteenth century and the early years of the nineteenth, the tree is very common in Europe and the United States. The balsam poplar, or tacamahac (*Populus balsamifera*), a common ornamental tree, is a native of both North America and Siberia, has viscid leaf buds and whitish, ovate-oblong leaves, which in spring are of a delicate yellow tint and have an agreeable fragrance. The erect, fastigiate manner of growth approaches that of the Lombardy poplar. The cottonwood (*Populus deltoides*), frequently planted for ornament, is the largest of the poplars, specimens 150 feet high and 7 feet in diameter being not uncommon in moist soil along rivers and lakes. It abounds from Quebec to the Northwest Territory, and south to Florida and New Mexico. In Europe it is known also as the black Italian poplar and Canadian poplar. In the Western States the tree is planted for fuel and for its timber, which is considered valuable. *Populus heterophyllà*, the swamp poplar, is common from New York to Georgia and west to Arkansas and Texas. It is a tree 80 feet high and has very large cordate leaves. There are a number of other American species, which differ mostly in size of tree and shape of the leaves.

Fossil poplar leaves are known in the Cretaceous rocks of Greenland and are common in most plant-bearing beds of the Tertiary, differing little from the modern species.

POPLAR BLUFF. A city and the county seat of Butler Co., Mo., 73 miles west by south of Cairo, Ill., on the Black River and on the St. Louis, Iron Mountain, and Southern, the Butler County, and the St. Louis and San Francisco railroads (Map: Missouri, F 5). It is situated in a district interested chiefly in lumbering and cattle raising, and carries on a considerable trade in the products of its manufactories, which include automobile spoke works, stave, heading, and hoop mills, a large cooperage, and lumber mills. The water works are owned by the municipality. Pop., 1900, 4321; 1910, 6916.

POPLAR INSECTS. Of several borers which damage the trunks and twigs of both native and Lombardy poplars, *Saperda calcarata* is most objectionable. The beetles are found and lay their eggs commonly in August and September. The same species also affects cottonwood in the Western States. The poplar girdler (*Saperda concolor*) frequently girdles the upper branches of large trees, the beetles issuing about the end of May. One of the largest of the longicorn beetles of the United States (*Prionus laticollis*) lives in the larval state in the trunks and roots of the Lombardy poplar, but occurs also in apple, grapevine, and pine. The poplar goat moth (*Cossus centerensis*) lays its eggs commonly on the bark of the aspen (*Populus tremuloides*) and also on the bark of balm of Gilead (*Populus balsamifera*). Another common borer in this tree is the Lombardy poplar borer (*Agrilus granulatus*), and still another is the poplar ægeria (*Ægeria tricincta*). A number of caterpillars attack the leaves, including the common tussock-moth caterpillar, the poplar spanworm (larva of *Biston ursaria*), the larva of the Antiopa butterfly, and the larva of the common butterfly, *Limenitis disippus*, as well as the larva of the Io moth and several other moths. The insect fauna of the poplar in the United States comprises more than 100 species, including several geometrid and noctuid larvæ, a number of leaf miners and leaf folders, and several species of plant lice. Consult A. S. Packard, *Insects Injurious to Forest Trees* (Washington, 1890).

BROAD-NECKED PRIONUS (*Prionus laticollis*).

POP'LIN (Fr. *popeline, papeline*, from It. *papalina*, poplin, from *papa*, pope; so called because first made at Avignon, the papal residence from 1309 to 1376). In the fifteenth century a fabric was woven in Avignon called *papeline*, which was made of silk and was much esteemed. An attempt to imitate it was made in England, and in 1775 the manufacture was introduced into Ireland by French Protestant refugees, and from that time Irish poplins have been famous. What the exact nature of the original *papelines* was is not certainly known; but the best modern poplins consist of a warp of silk and a filling of worsted, which gives to the material substance combined with great softness and elasticity. The filling, or weft, is made heavier than the warp. This gives the material a corded surface resembling rep. In double poplin both the warp and the woof are very heavy, making the corded appearance more prominent.

POPOCATEPETL, pō̍-pō'kȧ-tā'pĕt'l (Aztec, smoking mountain). A volcano situated about 40 miles southeast of the city of Mexico (Map: Mexico, J 8). It rises in the form of a cone to a height of 17,520 feet above sea level and is composed chiefly of porphyritic obsidian. Forests girdle its lower parts, and vegetation ceases only near the snow line. About the period of the Spanish conquest it was very active, but no considerable eruption has been recorded since 1548, though minor eruptions occurred as late as 1802, and the crater still emits fumes. Its crater, which has a diameter of about 2700 feet, contains vast quantities of native sulphur in a very pure state. It is exploited from time to time by mining engineers, the system being unique. Indians are employed who ascend the mountain daily, fill sacks with sulphur in the crater, and then descend by sliding down the precipitous snow side of the volcano. The mountain was first ascended by Diego Ordez in 1522, and since that time the ascent has been accomplished a number of times.

POPOL VUH, pō̇-pōl′ vo͞o′ (Quiché, national book). The sacred book of the Quiché (q.v.) of Guatemala. It consists of fragments, more or less complete, of the national traditions and legends, written down in the Quiché dialect, at some unknown early date after the conquest, by a native who was evidently familiar with the ancient records. It is in two parts, the first containing the ancient mythology, the second the early history of the tribe, supplemented by a history of the neighboring and cognate Cakchiquel (q.v.). There is evidence that at least a part of it was originally in rhythmic form. A Spanish translation by Father Ximenes was published in Vienna in 1857, and the original text, with French translation, was issued at Paris by the Abbé Brasseur de Bourbourg in 1861.

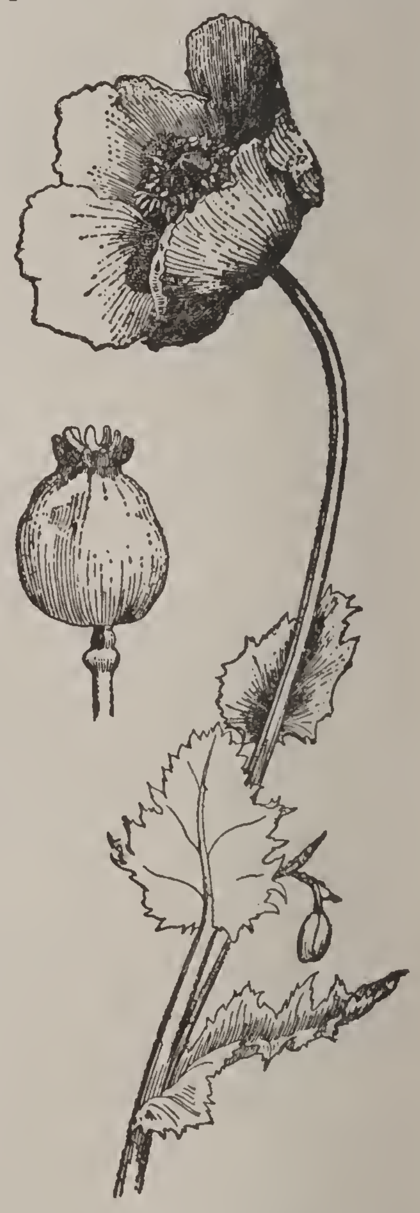
POPOV, pō̇′pôf, Ivan Gregorevitch (1859–). A Russian composer. He was born at Ekaterinodar and received his musical education at the Moscow Philharmonic School. After 1900 he was director of a music school conducted by the Russian Imperial Music Society at Stavropol (Caucasia). His published compositions include: *Symphony in E Minor*, a symphonic poem *In der Freiheit*, *Andante Religioso* for string orchestra, the overture *Ivan the Terrible*, *Oriental Suite*, *Armenian Rhapsody*, *Spanish Dance*, and a number of songs.

POPPÆ′A SABI′NA (?–66 A.D.). A wife of the Emperor Nero. She was the daughter of Ollius, a client of Sejanus (q.v.), but took the name of her mother's father, who was consul in the year 9. She married Rufius Crispinus, prætorian prefect, but, after becoming the mistress of Otho (q.v.), was divorced from Crispinus. She then married Otho and soon aroused the desires of Nero, who sent her husband to Lusitania, made her his mistress, put his mother (Agrippina) to death at her instigation, then divorced and killed Octavia for her sake. Poppæa bore him a daughter in 63. The child died when but four months old. Poppæa was killed by a kick from her husband when she was again pregnant. She was entirely unscrupulous, luxurious, and proud, if we are to trust the highly colored narrative of Tacitus (*Annales*, xiv, 60 ff.; xv, 23). Besides her beauty her only good point seems to be that she urged on Nero clemency to the Jews, wherefore she won high praise from Josephus.

POP′PER, David (1843–1913). An Austrian violoncellist. He was born in Prague, studied in the conservatory there, became soloist and conductor in the Vienna Royal Opera, married the pianist Sophie Menter (q.v.) in 1872, and with her toured Europe. In 1886 he was divorced from his wife and settled at Budapest, where he was professor at the conservatory until his death. He died in Vienna. His playing, which was brilliant and remarkably sympathetic, placed him in the front rank of modern violoncellists, and his compositions for the cello are in universal use.

PÖPPIG, pẽ′pĭk, Eduard Friedrich (1798–1868). A German traveler and naturalist. He was born at Plauen, and after studying at Leipzig set out for Cuba in 1822. He spent two years there, then for some time he traveled in the United States, especially in central Pennsylvania, and in 1826 went through southern and central Chile. After spending two years in the forests of the Province of Maynas, where he lived with the Indians, he returned to Germany (1832) with valuable collections of botanical and zoölogical material, became professor of zoölogy at Leipzig (1833), and did much for the foundation of the zoölogical museum in that city. He wrote *Reise in Chile, Peru, und auf dem Amazonenstrom* (1835) and *Illustrierte Naturgeschichte des Tierreichs* (1851).

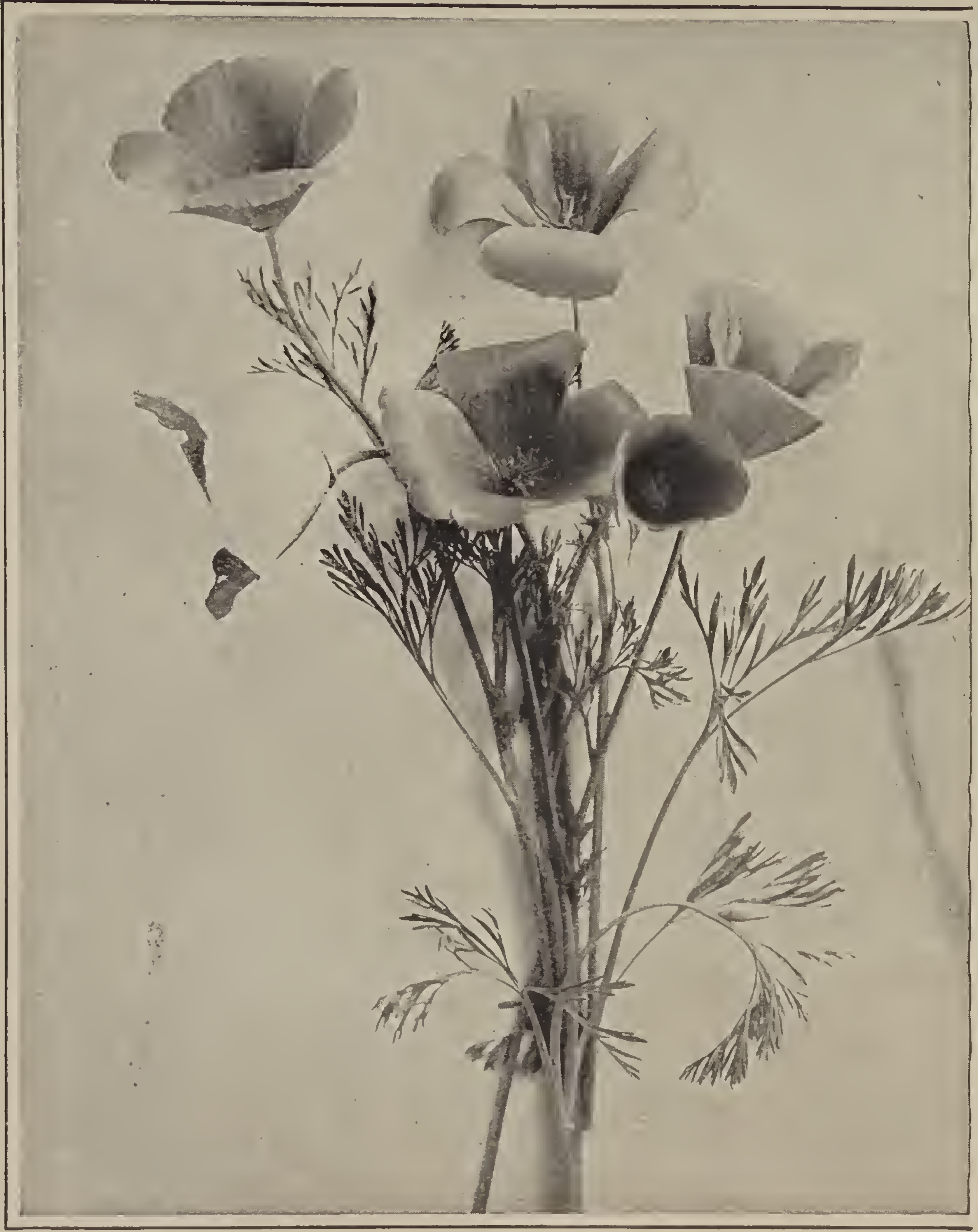
POP′PY (AS. *popig*, *papig*, from Lat. *papaver*, poppy), *Papaver*. A genus of the family Papaveraceæ, annual and perennial bristly-haired herbs, natives mostly of warm countries. The leaves are alternate and entire or lobed and cut. The poppy has been in cultivation from early times. It was grown by the Swiss lake dwellers, and a species native to the shores of the Mediterranean was utilized by the Greeks and Romans. By far the most important species is the opium, white, or oil poppy (*Papaver somniferum*), important alike for its yield of opium (q.v.) and for the bland, fixed oil of the seeds, used like olive oil. The seed contains no opium nor any narcotic principle, and was well known to the ancients as a pleasant article of food. The seeds yield about 40 per cent of the oil, and the oil cake is useful for manure or for feeding cattle. In the cultivation of the poppy for oil the seed is often sown in autumn, where the severity of the winter frosts is not to be feared; in more northern parts it is sown in spring, and sometimes the seed is scattered on the snow. Being very small, it needs little or no harrowing. Early sowing is favorable to the size of the plant and the yield. The plants are often cultivated in drills. An open but rich soil is best, and a sheltered situation is necessary, as in exposed situations much of the seed is scattered by the wind. In the United States the poppy is known chiefly as a garden flower.



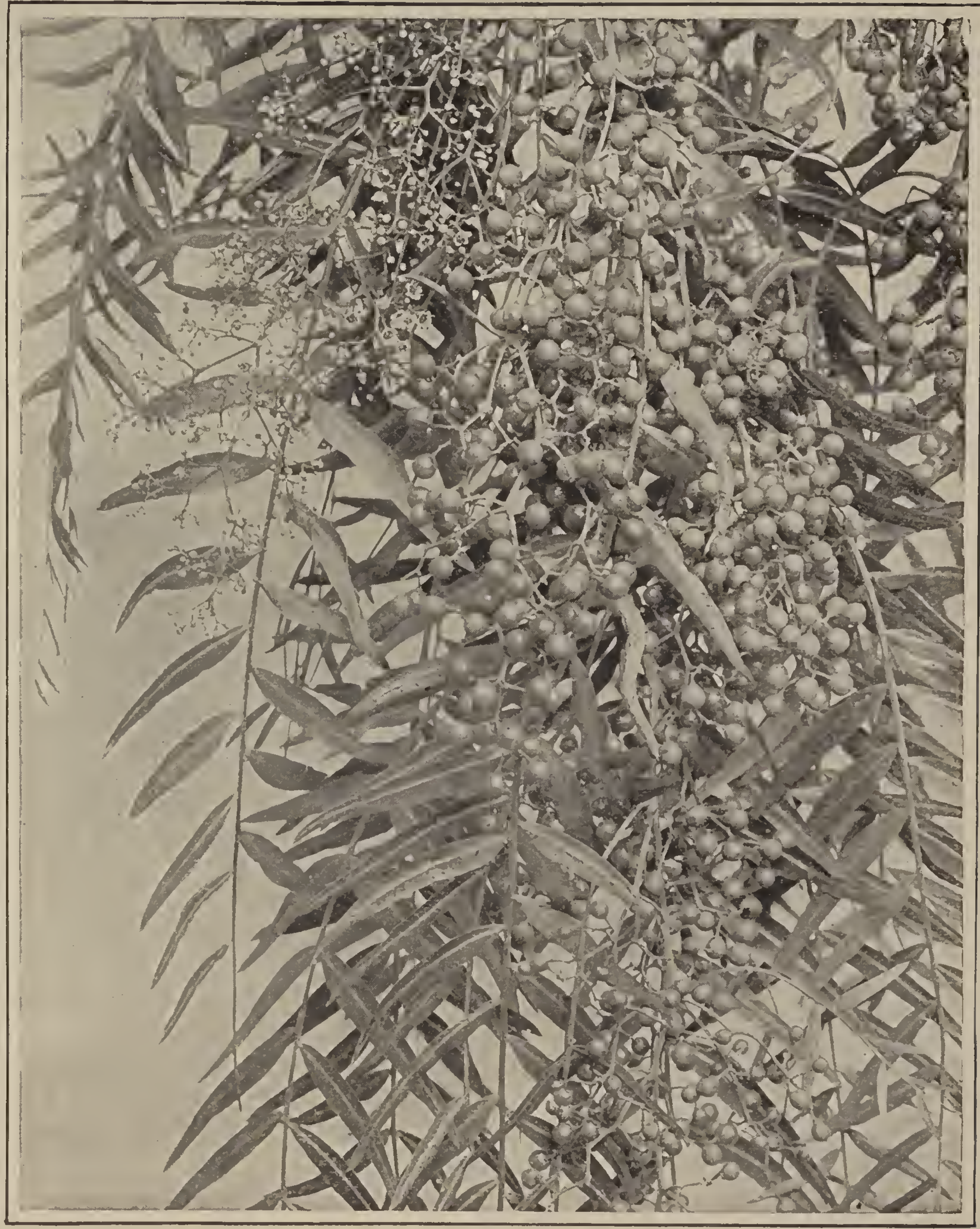
OPIUM POPPY.

Under cultivation the flowers of the poppy readily become double, and a large number of ornamental varieties have been derived from various species. As ornamental plants they are popular on account of their large showy flowers, their hardiness, and their ease of culture. The Oriental poppy (*Papaver orientale*), a native of Armenia, is one of the most important decorative species. Its flowers, which are deep crimson, are larger than those of any other species. The Iceland poppy (*Papaver nudicaule*), a native of Siberia and of the northern parts of America, has orange or yellow flowers and is a widely distributed alpine species. The Oriental and the Iceland poppy are the best perennial species cultivated for ornament. The corn poppy, or common red poppy (*Papaver rhœas*), is an annual occurring as a weed in European grain fields, especially on calcareous soils. Its

POPPY AND PEPPER-TREE



CALIFORNIA POPPY (Eschscholzia Californica).



BRANCH OF PEPPER-TREE (Schinus Molle).

bright-red flowers make it very conspicuous. A large number of ornamental varieties have been developed from this species. The ornamental poppies grow well in any garden soil, but they produce the best results on sandy loams. The seed is sown in spring in shallow drills where the plants are to bloom, and the young plants are later thinned to about 1 foot apart. The California poppy is *Eschscholtzia* (q.v.). For illustration of California poppy, see Plates of CALIFORNIA FLORA and POPPY AND PEPPER TREE. See also OPIUM.

POPPY ANEMONE. See Plate of ANEMONE.

POPPY FAMILY. A family of plants. See PAPAVERACEÆ.

POPPY-SEED OIL (*Oleum papaveris*). A pale-yellow drying oil obtained from the seeds of the opium poppy (see POPPY) by pressure. It is used for salads, soap stock, and as a paint vehicle. When used, either boiled or unboiled, in mixed paints with zinc base, it is less likely to injure delicate shades than is linseed oil.

POPULARES. See OPTIMATES AND POPULARES.

POPULAR GOVERNMENT. In the most general sense the government of the political affairs of a nation by the people at large, either by popular assemblies of the mass of the people or through representatives chosen by them by some form of election. It thus includes the direct control by the popular will not only of legislation but of administration and of judicial action as well. As in any form of popular government which has yet been realized the expression of the popular will is much hampered by tradition, custom, and the legal forms through which it is forced to operate, popular government has come to signify the extent to which the people at large have succeeded in directing the actual energies of the government in a given nation. In many countries in which the forms of popular government have been adopted or retained, as in the early Roman Empire and in Germany to-day, the actual control exercised by the popular will is small, while in others, as in Switzerland and the United States, it is much larger, but nowhere is it complete. It may be said, therefore, to represent an ideal and a tendency rather than an actual achievement and to be one with the democratic movement of the present time. Consult: Jean Jacques Rousseau, *Du contrat social* (1762); J. S. Mill, *Liberty* (London, 1859); id., *Representative Government* (ib., 1911); John Morley, *Rousseau* (ib., 1873); Sir J. F. Stephen, *Liberty, Equality, Fraternity* (ib., 1873); H. S. Maine, *Popular Government* (New York, 1886); *The Federalist* (ib., 1904); Lobingier, *The People's Law* (ib., 1909); E. Faguet, *The Cult of Incompetence* (ib., 1911); L. T. Hobhouse, *Liberalism* (ib., 1913); H. Croly, *Progressive Democracy* (ib., 1914). See DEMOCRACY; GOVERNMENT; REPUBLIC.

POPULAR SOVEREIGNTY, or SQUATTER SOVEREIGNTY. Terms in American history used interchangeably by many writers and having reference to the right of the inhabitants of a Territory to regulate their internal affairs in their own way without the intervention of Congress. Strictly speaking, the term "popular sovereignty" was applicable only in the case of an organized Territory, while "squatter sovereignty" applied only to an unorganized territory inhabited by squatters. The theory of popular sovereignty grew out of the discussions over the question as to whether slavery should be permitted in the territory acquired from Mexico. The first assertion of the doctrine by a man of prominence appeared in the noted Nicholson letter of General Cass, Dec. 24, 1847, in which he expressed the opinion that the people of the Territories should be left "to regulate their internal concerns in their own way." The new doctrine was accepted by the South, and was quite generally regarded with favor as being in harmony with the American traditions of local self-government, and furthermore as relieving both Congress and the States from the responsibility of settling a vexatious question. The compromise measures of 1850, in providing for the organization of New Mexico and Utah as Territories without any reference to slavery, would seem to have been the first recognition of the principle, although, on account of the evasive language used, it is difficult to say whether popular sovereignty was a feature of the bill or not. In the later discussions the Southern Democrats declared that it was not; but Stephen A. Douglas, the great champion of the new theory, asserted that it was. In 1854 the Kansas-Nebraska Bill (q.v.) expressly adopted the principle as the basis for the government of those Territories. Shortly afterward the South came to repudiate the doctrine of popular sovereignty as dangerous to slavery, and put forward the claim that neither Congress nor the Territorial authorities could legislate against slavery in the Territories, but that it was their constitutional duty to protect the right of property in slaves as recognized by slave States. There is an *obiter dictum* in the famous Dred Scott case (q.v.) which upholds the Southern contention so far as the national government was concerned. The controversy regarding the question of popular sovereignty, as involved in the Lecompton Constitution (q.v.) for Kansas, brought about a division between the Douglas Democrats of the North and the more radical Southerners, which eventually developed into the split of 1860. With the Civil War and the abolition of slavery the question lost its significance.

POP'ULATION (ML. *populatio*, from *populare*, to populate, from Lat. *populus*, people; connected with *plenus*, full, and ultimately with Eng. *full*). The number of living human beings. This article presents the principal facts regarding the number of human beings and the number in various classes, reserving for the article VITAL STATISTICS the main facts regarding the increase in the number of human beings. The distinction between population and vital statistics corresponds closely to the distinction between the main sources of information, viz., the census reports and registration reports. In census reports the element of time is either disregarded or reduced to a minimum and an attempt is made to photograph certain aspects of the population as they were on the census day. Registration reports are records of certain defined events within a population group, such as births and deaths, marriages and divorces, immigration and emigration, legal punishments for crimes, the record being made at the time of, or soon after, the event recorded. Inferences regarding the increase of a population may in time be derived from comparing a series of censuses; but the census cannot give detailed information about increase or decrease derivable from registration reports.

At present two-thirds of the population of the earth has been counted. The extension of representative institutions has necessarily extended the census as an accurate means of counting population, for under a representative system political power is distributed in some measure according to numbers. It is not surprising, therefore, that the United States, as a great modern country with representative institutions, was the first to count its population by a census. The world's population has been estimated by leading statistical authorities at various dates during the past century as follows (stated in millions):

YEAR	Europe	Asia	Africa	America	Oceania
(a) 1810...	180	380	99	21	3
(b) 1828...	214	481	109	40	4
(c) 1848...	245	620	190	50	5
(d) 1874...	301	798	203	85	5
(e) 1886...	347	822	197	112	6
(f) 1907...	406	918	126	150	7
(g) 1914...	440	908	162	165	8

Statistical authorities: (a) Gotha, (b) Balbi, (c) Muchelot, (d) Behm-Wagner, (e) Levasseur, (f) Bodio, (g) Austin.

The population of the earth's surface in 1914 was probably about 1,675,000,000. About nine-tenths of this population is included within the jurisdiction of eleven of the principal states of the world. The distribution in round numbers is as follows, the figures embracing all colonial possessions and dependencies of every kind (some merely nominal):

COUNTRY	Population in millions
Chinese Empire	325
British Empire	440
Russian Empire	174
France	80
United States (including Porto Rico and the Philippine and Hawaiian Islands)	110
German Empire	79
Austria-Hungary	50
Japan	73
Netherlands	44
Ottoman Empire	21
Italy	37

Increase. At no time since recorded history began has the increase of population been so rapid as during the last century, especially the second half of it, when the outflow of people from western Europe to America, Australia, and South Africa added great numbers to the population of those continents, without a corresponding decrease in the countries from which they set forth. (See Emigration.) The world's population in 1814 is estimated by the best authorities at about 700,000,000 and in 1914 at 1,675,000,000, having thus considerably more than doubled in a century. This rapid growth in world population in the last century is owing in part to improved medical and sanitary conditions by which the span of life is extended, in part to the opening to population and production of great areas formerly unpopulated and unproductive, and in part to improvement in facilities for transporting food supplies from the producing areas to those whose dense population is engaged in other industries. The population living within the present area of the German Empire in Europe increased about 62 per cent in the half century 1814–64 and about 75 per cent in the half century 1864–1914, notwithstanding the large emigration during a part of that period. The population on the present territory of Italy increased in the first half of the nineteenth century about 43 per cent and in the last half about 35 per cent. The population of Great Britain and Ireland increased in the first half of the century about 70 per cent and in the last half about 50 per cent. The United States of America increased in population during the first half of the century 340 per cent and during the second half 228 per cent. In the 50 years ending with 1912 the increase in population was: Russia in Europe, 90 per cent; Germany, 62 per cent; England, 59 per cent; Hungary, 46 per cent; Austria, 41 per cent; France, 10 per cent; Europe as a whole, 50 per cent; and the United States, 190 per cent, the large per cent of increase in the United States being due in part to immigration. But in a case where the initial population is small, percentages are less significant than figures of actual increase. The United States added to its population between 1800 and 1850 nearly 18,000,000 people, between 1850 and 1900, disregarding the accessions of territory since 1890, it added nearly 52,500,000, and in the period 1900 to 1915 the increase was 14,000,000. At the present time there is no great country except Argentina in which population is increasing at a higher rate than in the United States. Notwithstanding the comparative sparseness of settlement in Canada, Mexico, and Australia, the percentage of increase in those countries is less, and in Europe there is no country in which the rate of growth approaches that of the United States.

Urban Population. No feature in the rapid increase in the population of civilized countries during the nineteenth century has been more marked than the growth of cities, both in the older European countries and in the newer countries whither that European population has migrated. In the United States the proportion of the population living in towns of 2500 or more was, in 1880, 29.5 per cent; in 1890, 36.1 per cent; in 1900, 40.5 per cent; and, in 1910, 46.3 per cent. In England and Wales the percentage of population classed as urban by the official census was, in 1881, 67.9; in 1891, 72; in 1901, 77; in 1911, 78.1. In France the share of the population living in towns of 2000 or more was, in 1861, 28 per cent; in 1901, 37 per cent. In Germany the share of the population living in towns of 2000 or more was, in 1895, 50.2 per cent; in 1905, 57.4 per cent; in 1910, 60 per cent. In certain of the countries of Europe a strict determination of the line between urban and rural population is rendered difficult by rea-

COUNTRY	Per cent of population living in cities having at least 10,000 inhabitants	
	1800	1890
England and Wales	21.3	61.7
Scotland	17.0	49.9
Australia	....	41.4
Belgium	13.5	34.8
Saxony	8.9	34.7
Netherlands	29.5	33.5
Uruguay	....	30.4
Prussia	7.3	30.0
Argentina	....	27.8
United States	3.8	27.6
France	9.5	25.9
Italy	....	20.6
Ireland	7.8	18.0
Hungary	5.4	17.6
Canada	....	17.1
Austria	4.4	15.8
Japan	....	13.1
Mexico	....	13.0
Russia	3.7	9.3
British India	....	7.3

son of the fact that many engaged in agriculture live in towns and villages and go to their fields from day to day. The figures on page 52 speak for 1800 and 1890, or the nearest census years. The countries are arranged in the order of the proportion of urban population in 1890 in the table there shown. The figures illustrate the degree to which the growth of city population during the nineteenth century in nearly all parts of the civilized world outstripped that of population as a whole.

Sex. About half the probable population of the world has been enumerated with relation to sex. From the results it appears that about 50.3 per cent are male and 49.7 per cent female. In Europe alone, among the great divisions of the earth's surface, do the females outnumber the males, there being on that continent among the enumerated population about 49.4 per cent males and 50.6 per cent females. The numerical excess of females in Europe is much greater than the excess of males in the continents to which migration has mainly gone, such as America and Australia, therefore it follows that in the countries representing Caucasian or white civilization females outnumber the males. But in most other parts of the world for which we have information the reverse is true. Thus, in British India 50.9 per cent, in the tributary states 51.7 per cent, and in Japan 50.5 per cent of the population are male. The excess of males in these countries more than offsets the excess of females in all Europe.

Age. It is usual for a census to report the number of persons of each year of age, or at least the number falling within certain wider age limits. In large population groups the true number of persons living at any year of age is larger than the true number of persons at the next higher year, this being because of the fact that each such group as it advances from infancy to old age is steadily depleted by death. If the group is receiving a large number of immigrants, this would tend to neutralize for certain age groups the wasting away through death, but immigration is seldom, if ever, sufficient in amount to balance the losses from mortality. The births in successive years also vary in number, and thus the initial size of these successive groups differs; but neither this cause alone nor this combined with immigration and other minor disturbing factors makes it likely that the true number of persons in a country at any one year of age is ever smaller than the true number at the next greater year of age. The reported number very often is greater, this difference between the true and the asserted number being due to inaccuracy in the statements of age made in answer to the inquiries of the census enumerator. These inaccuracies vary with the degree of education and the economic position of the class reporting. Where they exist in large numbers they are indicated by a disproportionate number of individuals reported with ages at multiples of 5 and especially of 10. Internal evidence of the relative accuracy with which ages are reported, and perhaps indirectly of the relative accuracy with which other census questions are answered, may be found by measuring this concentration of reported ages on multiples of 5 and 10. The true number of persons in a community aged 30, 35, 40, 45, 50, 55, and 60 is probably about one-fifth of the total number whose age is reported as between 28 and 62 inclusive. The per cent by which the reported number of these seven ages exceeds the estimated number affords a measure of the irregularity of the age distribution and so of the probable error in the returns.

Perhaps the best single figure indicating the age composition of a population group is the median age, or an age such that half the members of the group are above and half are below it. For the white population of the United States this median age increased almost steadily during the nineteenth century from 16 in 1800 to 23.4 in 1900, the increase being due in part to the increased longevity of the adult population and in part to the steadily decreasing proportion of children.

The proportion of the population falling within various age classes is of importance for itself and as indicating reasons for other statistical differences between population groups. Thus, in Oklahoma 14.6, in South Carolina 15.1, and in Utah 14.1 per cent of the population were in 1910 under 5, these being the regions of the United States in which the proportion of children is greatest. At the other extreme there are the District of Columbia, with 8.1 per cent, California, with 8.1, and Nevada, with 7.8. The greatest proportion of elderly persons is found in the northern New England States, Vermont having 8.2, New Hampshire 7.9, and Maine 8.2 per cent of the population over 65 years of age.

Marital Condition. The relation of the population to the social institution of marriage is measured by numbering the classes of the single, the married, the widowed, and the divorced. This relation depends largely upon the age composition of the population group. The great majority of those who live to adult years marry, and half of those who marry are widowed, a small additional number being divorced. The age at which marriage is entered differs greatly according to the character of the civilization. Thus, in countries dominated by Caucasian standards it is usual to assume that marriage does not take place below the age of 15. In India, on the contrary, in 1891, 6 per cent of the boys and 17 per cent of the girls under 15 years of age were married. In uncivilized and semicivilized countries marriage of adults is practically universal. Celibacy is regarded as unnatural and is almost prohibited by social opinion. So in India of the women over 50 less than 1 per cent and of the men about 3 per cent remain single. In Europe and America, among persons who have lived through the reproductive period of life, the proportion of the single is from 10 to 20 per cent for women, except in Hungary and the United States, and from 7 to 14 per cent for men. In the United States the proportion of the population who are married has been ascertained for 1890 and 1900, with results that differ but little from the above. When the figures are analyzed by age it appears that among the young of both sexes there was a slight increase in the proportion of married persons, and at higher ages a slight decrease in the proportion of married, the two about offsetting each other. This change is contrary to the general trend in most countries and in one or two American States for which figures covering a longer period are available. It is probably the result of very prosperous conditions in the two or three years immediately preceding 1900, marriage figures constituting a sensitive measure of prosperity.

Religion. Civilized countries differ in regard to making inquiries into the religious affiliation of the population. In Italy, France, Great Britain, and the United States it is thought unwise to ask this question through the census. Accordingly the population, or the enumerated population, of the earth cannot be distributed with accuracy according to religious confession. According to a careful attempt made to secure approximate results in this field, the figures in round numbers are as follows:

RELIGION	Estimated number of adherents in millions
Christianity	570
Confucianism	275
Hinduism	210
Mohammedanism	225
Buddhism	140
Taoism	50
Shintoism	25
Judaism	13
Polytheism	120

The adherents of Christianity are subdivided as follows:

RELIGION	Estimated number of adherents in millions
Catholicism	270
Protestantism	175
Greek church	120
Minor divisions	5
Total	570

Language. There are no trustworthy statistics for the population of the earth as a whole or even for the civilized countries, indicating the number of persons using the main languages as their ordinary means of communication. There is no doubt that the number of languages spoken on the earth has rapidly decreased and is rapidly decreasing. There is no doubt that the number of persons speaking the main Aryan languages is rapidly increasing, both by the natural increase of the Caucasian population and by the extended use of these languages, with the extension of the trade and commerce of these countries.

Illiteracy. It is common, although not universal, to inquire at a census whether the person is able to read and write. With the extension of education in most civilized countries the proportion of illiterates among the population is declining. At present this proportion, in Christian countries, is greatest in the Slavic peoples and among the negroes of the United States. An intermediate position is held by the Romance countries of Europe and Hungary, and the highest position is occupied by England, the United States, and the Germanic countries of Europe. Consult: A. F. Weber, *Growth of Cities in the Nineteenth Century* (New York, 1899); C. E. Stangeland, *Pre-Malthusian Doctrines of Population* (ib., 1905); C. E. Woodruff, *Expansion of Races* (ib., 1909).

See EMIGRATION; IMMIGRATION; VITAL STATISTICS.

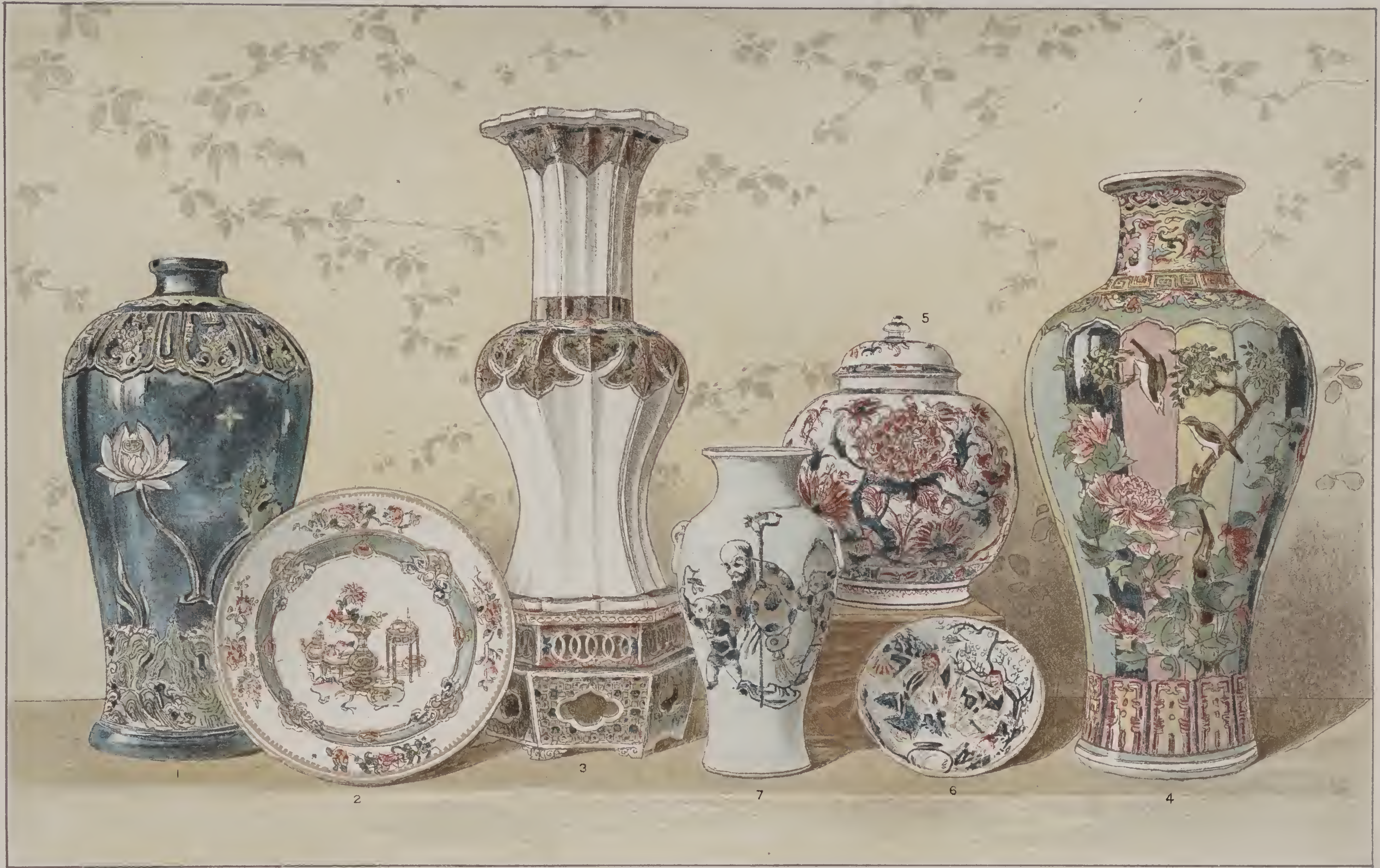
POPULATION, CENTRE OF. See CENSUS.

POP'ULIST PARTY, or PEOPLE'S PARTY. A political party in the United States, organized at Cincinnati in May, 1891, by a national convention composed chiefly of representatives of the agricultural and industrial classes. The party grew out of the movements previously inaugurated by the Grangers and the Farmers' Alliance (q.v.), which had in view the general social development of country people. Its leaders were mostly young men of ability and devotion. They first went into active politics in 1890, when they carried the Legislatures of Kansas and Nebraska and elected 9 Farmers' Alliance members of Congress and forced 34 others, Democrats and Republicans, to pledge themselves to carry out the ideas of the farmers' movement. Its platform of principles demanded the free and unlimited coinage of silver; the abolition of the national banking system; the issue of fiat money in sufficient quantity to transact the business of the country on a cash basis, and the loan of such currency to the people at not more than 2 per cent per annum on nonperishable agricultural products; national ownership of all means of public communication and transportation; a graduated income tax; popular election of United States Senators; the adoption of the initiative and referendum in legislation; and the prohibition of alien ownership of land. On July 2, 1892, a national convention of the Populist party met at Omaha, Neb., for the purpose of nominating candidates for President and Vice President of the United States. It adopted a platform embodying the above-mentioned views and nominated James B. Weaver of Iowa for President and James G. Field of Virginia for Vice President. The Populist ticket received 22 electoral votes and a popular vote of 1,055,424. It carried several State Legislatures and sent five Senators to Washington. In the next presidential campaign, that of 1896, the Populist party nominated for President W. J. Bryan, who had already received the nomination of the Democratic party, and for Vice President Thomas E. Watson of Georgia. Most of the Populist party supported Bryan and the Democratic candidate for Vice President, Arthur Sewall, but a considerable portion of the party stood for the independence of their movement, and voted for Bryan and Watson. On account of their refusal to depart from the path marked out by themselves the latter were called the Middle-of-the-Road Populists. In order to have the full Populist vote counted for Bryan, an arrangement was made between the two parties in 28 States by which each was to have a proportionate representation on the electoral ticket. As a result of this arrangement Bryan received 176 electoral votes, while Sewall received 149 and Watson 27. The Populist platform of 1896 differed but slightly from that of 1892. In the campaign of 1900 the Populist party again nominated for President W. J. Bryan, who was also the Democratic nominee, but it again refused to indorse the Democratic nominee for the vice presidency (Adlai E. Stevenson of Illinois). After a spirited contest Charles A. Towne of Minnesota received the nomination for Vice President, but he subsequently withdrew, and the National Executive Committee of the Populist party substituted Stevenson. In addition to its old principles the party in 1900 denounced the imperialistic policy of the government, expressed sympathy for the Boers in their struggle with Great Britain, advocated municipal ownership of public utilities, and condemned the practice of the courts in issuing injunctions in labor disputes between employers and employees. Consult: Reynolds, *National Platforms and Political History* (Chicago, 1898); H. T. Peck, *Twenty Years of the Republic, 1885–1905* (New York, 1907); J. A. Woodburn, *Political Parties and Party Problems in the United States* (2d ed., ib., 1914).

POP'ULO'NIA. An ancient town of Italy. See PIOMBINO.

POP'ULUS. A Roman designation for the sovereign people. See PATRICIAN; PLEBEIANS;

PORCELAIN - I.



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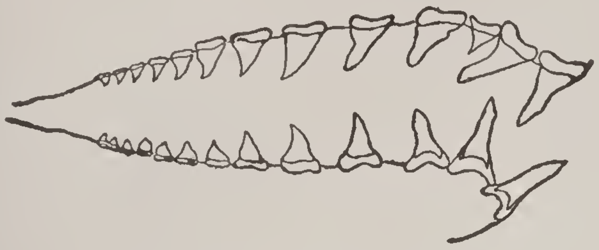
1 CHINESE VASE PAINTED IN COBALT
2 CHINESE SOUP PLATE OF EGGSHELL PORCELAIN_18TH CENTURY
3 LARGE CHINESE VASE ON PORCELAIN PEDESTAL_DATE ABOUT 1600
4 CHINESE WINE JAR OF THICK PORCELAIN
5 JAPANESE HIZEN JAR_18TH CENTURY
6 MODERN JAPANESE CUP_19TH CENTURY
7 CHINESE ENAMELED PORCELAIN JAR-MING DYNASTY

Rome, *History of Rome during the Earliest or Regal Period*, third paragraph and last paragraph.

POQUELIN, pŏk'lăɴ', Jean Baptiste. See Molière.

POQUOSON. See Pocosin.

POR'BEAGLE (from Fr. *porc*, hog + Eng. *beagle*), or Mackerel Shark. Specifically, a ferocious shark (*Lamna cornubica*), bluish gray in color and reaching a length of 10 feet, which is found in both the North Atlantic and the North Pacific. The term is extended, however, to include the whole of its family (Lamnidæ), which contains several pelagic species, often of great size, power, and ferocity, with stout bodies, a wide mouth with separate, triangular, highly specialized teeth (the third in the upper jaw always small), large gill openings, and great fleshy fins. In addition to the typical porbeagle (a British name) a well-known species (*Isurus oxyrhynchus*) haunts the Mediterranean, where it is called *cane de mare;* and a rarer one (*Isurus dekayi*) occurs on the North American coast. The largest and most cosmopolitan of the family is the great white man-eater shark (q.v.).


TEETH OF A PORBEAGLE (SIDE VIEW).

POR'CELAIN (OF. *porcelaine, porcellaine*, Fr. *porcelaine*, from It. *porcellana*, porcelain, Venus-shell, so called because the highly polished surface suggested that of the Venus-shell, whose curved upper surface resembled a pig's back; from *porcella*, dim. of *porco*, pig, from Lat. *porcus*, swine, hog, pig). A variety of pottery whose principal characteristics are vitrification and translucency. All porcelains may be divided into three groups, according to their body composition, viz., (1) hard paste, (2) artificial soft paste, (3) natural soft paste.

Manufacture. Hard paste porcelain is composed of two essential materials, kaolin and feldspar (Chin. *petuntse*), but quartz and certain kinds of sands are occasionally added. In the usual process of manufacture the paste is slightly baked at a comparatively low temperature. The glazing preparation, which is composed of the same materials as the body, but in different proportions, and to which not unfrequently (as in Chinese wares) lime is added, is then applied to the biscuit, usually by dipping, but sometimes with a brush or by insufflation, after which the porous ware, covered with the dry glaze, is placed in a sagger and removed to the kiln, where it is subjected to an intense heat ranging from 1500° C. (2732° F.) to 1800° C. (3272° F.). The body of the ware, at this great temperature, becomes vitrified throughout the mass, and the glaze is melted into the paste, forming a hard, homogeneous material. Hard porcelain is usually left unglazed on the base, to prevent adhesion to the saggar in the great heat of the kiln. It is so hard that it cannot be scratched by steel, when applied by hand, and is, as a rule, of a bluer tint than soft paste porcelain, and when pressed with the palm of the hand or touched with the tongue is perceptibly colder, being a better conductor of heat. An examination of the edge of a broken piece will show that it has a conchoidal fracture, that it is vitrified throughout, and that the glaze is incorporated with the body.

Artificial soft paste porcelain, or fritted porcelain (Fr. *pâte tendre*), is an alkaline paste into which the ordinary china clays do not enter. It is a connecting link between hard paste porcelain and natural soft paste porcelain. It is a glasslike substance composed of siliceous sand, nitre, gypsum, alum, soda, and sea salt, fritted together, combined with a small portion of calcareous marl or chalk, the proportions of the ingredients varying at different factories. It is covered with a rich lead glaze of a creamy-white tint and an unctuous, waxy surface. Fritted porcelain is the result of the first attempts of European potters to imitate the Chinese and Japanese wares. One of its most marked peculiarities is the presence in the paste of pyrophanous effects, in the form of translucid spots, known as "mooning," caused by the imperfect blending of vitreous particles. These spots can be distinctly seen when a piece of this variety of porcelain is held before a strong artificial light. This phenomenon does not occur in natural soft paste nor in hard paste porcelain, except in some of the earliest Meissen ware.

Natural soft paste porcelain is varied in composition at different factories, being made up of ball clay, kaolin, feldspar, and a large proportion of phosphate of lime in the form of bone dust. In some varieties steatite, or soapstone, is introduced. It does not require so high a temperature as hard paste. A boracic glaze is generally used, which, being exceedingly fusible, causes the colors of the decoration to sink in, thus producing beautiful, soft effects. Unlike hard paste the bases of pieces are usually glazed, as they are supported in the kiln by stilts, triangles, or cockspurs. As the glaze is not incorporated with the paste as in hard porcelain, the fractured surface of a broken piece will show the glaze, as a thin layer of transparent glass, and when touched with the tongue the unglazed edge has a slightly absorbent quality.

History. 1. Hard paste porcelain originated in China, and Chinese writers have attributed to it an impossible antiquity, some even carrying the invention back to the Han dynasty (206 B.C.–220 A.D.). It is now believed that true porcelain, as we know it to-day, first appeared during the Ming dynasty, which was not established until the fourteenth century. Indeed, it is extremely doubtful whether any authentic specimens antedating the fifteenth century are known to exist. The Chinese themselves classed all ceramic wares of great hardness which possessed the property of resonancy (an indication of vitrification) with porcelain, including those opaque varieties which are to-day grouped with stoneware. The green porcelain of the Sung and Yuan dynasties, known to the French as celadon, cannot properly be included with porcelaneous pastes, but before the general manufacture of translucent bodies a porcelaneous glaze was used on stoneware to some extent. While porcelain was produced through most of the reigns of the Ming and recent Ch'ing dynasties, there are several periods which stand out in greater prominence on account of the superior excellence of their manufactures. The Chia Ch'ing reign (1522–66) was noted for a rich dark blue, almost approaching black, called Mohammedan, or Mussulman, blue, which was imported from abroad. In the Wan Li period (1573–1619) porcelain was made in great abundance, and the majority of pieces in collections attributed to the Ming dynasty are of this reign. Enamel colors were first introduced in combination with underglaze blue. The most brilliant epoch in Chinese ceramic art, however, was in several of the reigns of the Ch'ing dynasty. In the K'ang Hsi period (1662–1722) many new glazes were developed, including the much prized *sang de bœuf*, or ox blood; the peach bloom; the *clair de lune*, so called by French collectors; enamels in rich greens (the *famille verte* of Jacquemart); the powder blue and mirror black. The so-called hawthorn vases are also attributed to this reign. This was also the best period of underglaze blue painting. In the next two reigns, the Yung Cheng and Ch'ien Lung, the *soufflé* and *flambé*, or transmutation, glazes were brought to great perfection. Pink or rose enamels (the *famille rose* of Jacquemart) appeared, and crackled glazes were greatly improved. Rice-grain porcelain and the celebrated lace bowls were first produced, and many new glazes, including the iron rust and tea dust, were brought to great perfection. It was at the end of the Ch'ien Lung reign that the ware until recently known in England and the United States as Lowestoft china began to be made for the European and American markets.

The manufacture of porcelain in Japan does not antedate the sixteenth century, when the art was transplanted from China. The porcelain of Japan is similar in composition and technique to that of China, although the materials used are of a somewhat different character. The Japanese paste is not quite so pure, and the ware is usually thicker and less skillfully potted. Beautiful porcelains, however, were produced at Arita, notably an ivory-white, fine-grained ware which was originated by a potter named Kakiyemon. The decorations consisted of simple motives painted in brilliant enamels and gold, scattered sparingly over the surface. This new and chaste style, which was fully perfected about the middle of the seventeenth century, took the name of its originator, and was imitated on the fritted porcelains of Europe, particularly those of Chantilly, Bow, Chelsea, and Worcester.

Hard paste porcelain was not produced in Europe until about 1709, when Johann Friedrich Böttger began his experiments at Meissen, near Dresden. His first success was in closely imitating the Boccaro ware (so called by the Portuguese), or red stoneware of the Ming dynasty, and a few years later, by an accidental discovery of kaolin, he succeeded in producing a white porcelain closely resembling, in all important respects, the Oriental wares. Hard-porcelain factories were established at Berlin and Vienna, and later in other parts of Europe. In 1769 the manufacture of hard paste was commenced at Sèvres, where it has been continued uninterruptedly until the present day. In England the production of hard paste was commenced at Plymouth in 1768 and at Bristol in 1770, but these enterprises were comparatively short-lived. At Capo di Monte and other places in Italy a peculiar kind of hard paste, of rather coarse grain and grayish tint, was made about the middle of the eighteenth century, which manufacture extended into the nineteenth. This ware was distinguished by its colored reliefs representing mythological scenes. In 1825 the first hard-porcelain manufactory in the United States was established in Philadelphia by William Ellis Tucker, who derived his inspiration from the French porcelain of the period.

2. Artificial soft paste porcelain was the result of the first attempts of Occidental potters to reproduce the wonderful and much admired ware from the Orient, which reached Europe near the close of the sixteenth century. About 1580 a hybrid porcelain was made at Florence, Italy, under the patronage of the Medici family, and examples which have come down to us are marked in blue with the Medici arms or with the cupola of the Florence Cathedral. The forms of the pieces and the style of decoration are suggestive of Japanese influence. About 1677 artificial soft paste was first invented at Saint-Cloud, in the style of the stanniferous enameled faïence of the period. Factories were established at many other places in France during the eighteenth century—at Lille in 1711, at Chantilly in 1725, at Mennecy about 1734, at Vincennes about 1738, at Tournay about 1750, at Sèvres in 1756, and at Bourg-la-Reine about 1773. Early in the same century fritted porcelain also was being made at several places in Italy, notably at Venice, Doccia, Capo di Monte, and Le Nove. When Charles III ascended the throne of Spain in 1759, he took with him to Madrid (Buen Retiro) a colony of potters from Capo di Monte and founded a factory there. The ware was somewhat similar in style to the Italian, but more diaphanous and waxy in quality. In England artificial porcelain was produced at Stratford-le-Bow as early as 1745 and at Chelsea about the same time. At Derby the manufacture was commenced about 1756, and at Worcester, under the direction of Dr. John Wall, in 1751, where it was known as Tonquin porcelain, and a similar ware was being produced at Caughley about 1772. The English fritted porcelain was almost identical in composition with that of the contemporary French factories, and it is believed that French workmen were employed to introduce the manufacture at some of these works. Japanese porcelain furnished the inspiration for many of the painted patterns used on the fritted porcelains of the eighteenth century in France and England.

3. Natural soft paste porcelain, or bone china, is essentially an English invention, which was perfected when fritted porcelain was abandoned. Natural clays were substituted for the alkaline substances which largely composed the paste of the earlier wares, and bone ash was employed in large quantities, sometimes reaching 40 to 60 per cent of the whole. At Lowestoft natural soft paste was produced during the latter half of the eighteenth century, recent discoveries having dispelled the erroneous belief that the manufacture of hard paste was ever attempted there. Josiah Spode, the younger, of Stoke-upon-Trent, is generally credited with having fixed the standard for the composition of bone china, about 1800, since which time the principal British factories have been engaged in its manufacture.

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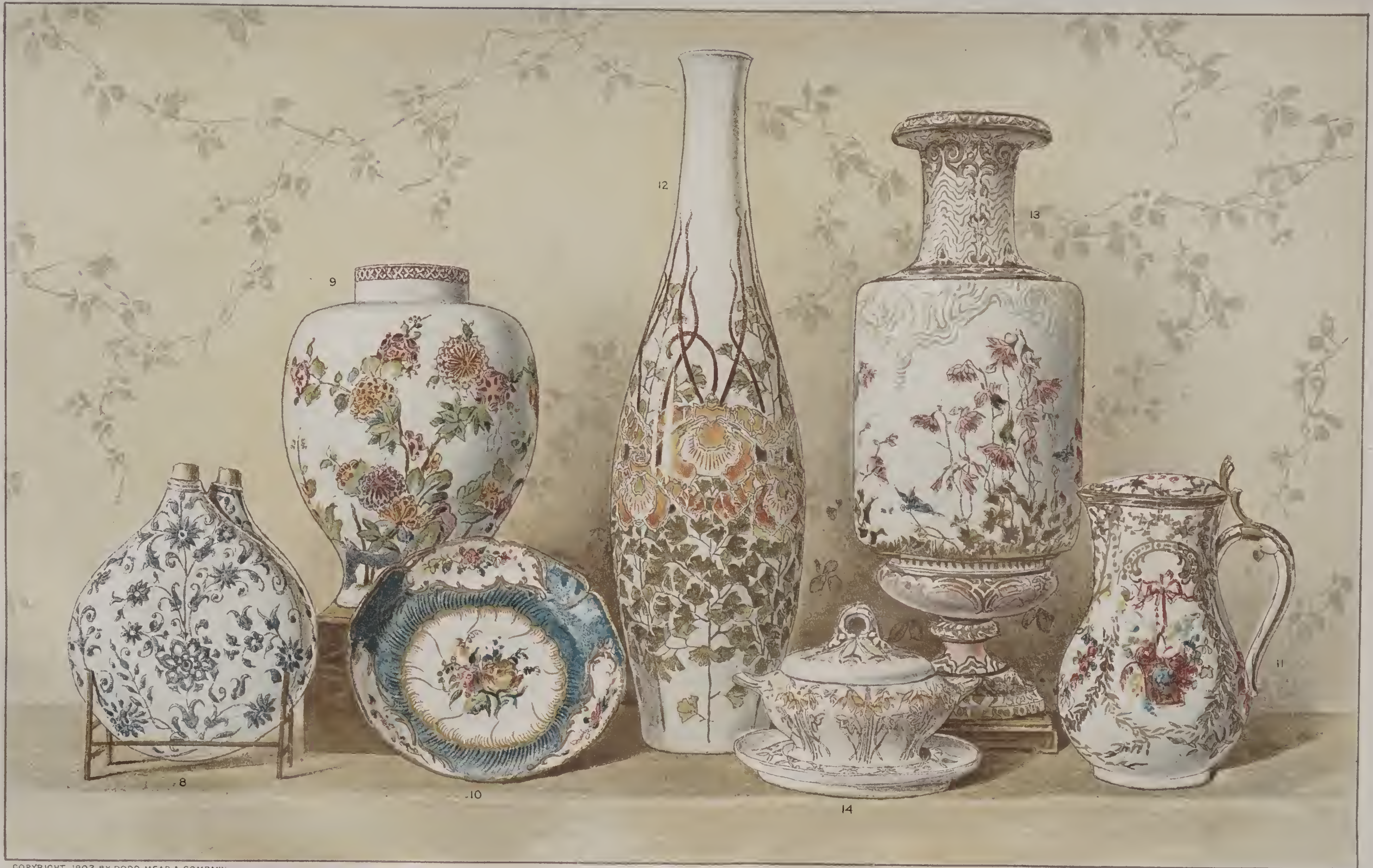
PORCELAIN - II.



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8 DOUBLE BOTTLE OF SOFT FLORENCE PORCELAIN_ABOUT 1581
9 PIECE OF VIEUX SAXE_HARD PORCELAIN OF MEISSEN
10 SEVRES DISH MADE BETWEEN 1753 AND 1756
11 SÈVRES PITCHER_1773
12 SEVRES VASE, RECENT
13 SEVRES VASE, RECENT
14 SUGAR POT OF HARD PORCELAIN WITH DECORATION OF GRAND FEU_1900

Bowes, *Keramic Art of Japan* (London, 1875); Dusartel, *La porcelaine de Chine* (Paris, 1881); Edouard Garnier, *The Soft Porcelain of Sèvres* (London, 1892); Grandidier, *La céramique chinoise* (Paris, 1894); S. W. Bushell, *Oriental Ceramic Art Collection of W. L. Walters* (New York, 1899); *La manufacture nationale de Sèvres: Exposition Universelle de 1900* (Paris, 1900); C. Monkhouse, *Chinese Porcelain* (London, 1901); W. G. Gulland, *Chinese Porcelain* (ib., 1902); Edward Burton, *English Porcelain* (New York, 1902); Solon, *Old English Porcelain* (London, 1903); William Dillon, *Porcelain* (ib., 1904); E. S. Auscher, *History and Description of French Porcelain* (New York, 1905); W. P. Knowles, *Dutch Pottery and Porcelain* (ib., 1905); R. L. Hobson, *Porcelain of All Countries* (ib., 1906); Count X. de Chavagnac (comp.), *Catalogue des porcelaines françaises de M. J. Pierpont Morgan* (Paris, 1910); *Catalogue of the Morgan Collection of Chinese Porcelains* (vol. i, with introduction by W. M. Laffan, ib., 1904; vol. ii, with introductory articles by S. W. Bushell, W. M. Laffan, and T. B. Clarke, ib., 1911); also general works on ceramic wares.

PORCELAIN TOWER. An octagonal structure in Nanking, China, erected in the early part of the fifteenth century. It had nine stories, faced with variegated porcelain, from which bells and lamps were hung. The tower was destroyed by the Taipings in 1853.

POR′CELANITE, or PORCELAIN JASPER. A metamorphic rock formed by the hardening under heat and pressure of argillaceous beds. It has the fracture of flint, and is gray to red in color, somewhat resembling jasper, from which it differs, however, in being more fusible.

PORCH (OF., Fr. *porche*, from Lat. *porticus*, porch, gallery, from *porta*, gate). A roofed structure built in front of and accessory to the entrance or doorway of a building. The roof may be a mere canopy supported on brackets, or a pedimented or arched roof, or even a balcony carried on columns, which may be few or many; or it may be a vaulted structure carried by piers or by walls, forming a chamber or vestibule external to the building, like the galilees (q.v.) of English churches. The term is not, however, applied to the pronaos (q.v.) or epinaos of classic temples, which are parts of the main structure; nor to a narthex (q.v.). A porch is always an accessory and external feature. When the porch has many columns it becomes a portico (q.v.).

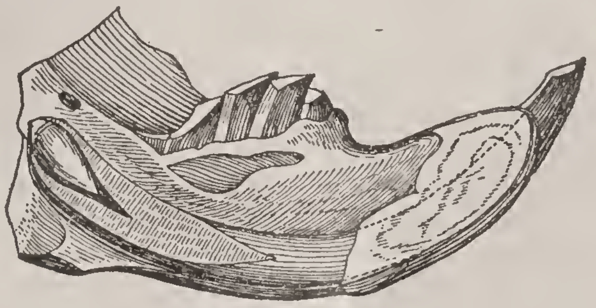
The porch first attained importance in Italian Romanesque architecture, especially in Lombard churches, whose entrances were often sheltered by arched or vaulted canopies supported on two columns borne on the backs of monsters. It reached its most magnificent development later in France (St. Gilles, St. Trophime at Arles, etc.), particularly in the superb porches of Notre Dame, Paris, and the cathedrals of Bourges, Rheims, Chartres, and Amiens. (See PORTAL.) The cathedral porches of the thirteenth century, especially in France, are made to shelter great numbers of statues of life size and larger and a still greater crowd of small figures under niches, and, in addition to this, much floral sculpture. In England there still remain many wooden porches of the fourteenth and fifteenth centuries, and one or two exist on the Continent. Finally, it must be mentioned that the lower story of a tower is often made to serve as a porch, having, perhaps, three doorways in its three free sides and in the fourth side a doorway into the church. The most elaborate porch of this character is connected with the church of Saint-Benoît-sur-Loire (Loiret), France.

In domestic buildings, especially in lands where there is much hot sun, it is common to have verandas, and these are porches if the access to the doorways of entrance is by means of them. The porches of American houses of 1730–1820 are often of elegant design and are now receiving the study they deserve.

The propylæa of a Greek palace or temple inclosure is to be considered a porch, although the person entering does not reach the main building immediately. See PORTAL; PROPYLÆA.

POR′CIA GENS (Lat., Porcian clan). A plebeian gens of Rome, appearing first in the third century B.C. Its most famous family bore the name of Cato (q.v.).

POR′CUPINE (OF. *porc espin*, It. *porco spino*, from ML. *porcus spinosus*, porcupine, spine hog, from Lat. *porcus*, swine, hog, pig + *spina*, spine, thorn). A large forest-dwelling rodent of the family Hystricidæ, characterized prominently by an armature of horny spines (porcupine quills) intermixed with coarse hairs. The family includes two well-defined subfamilies, the Old World porcupines, Hystricinæ, which are terrestrial and fossorial, and the New World porcupines, Sphingurinæ, which are arboreal and not fossorial. Other differences also occur in the skeletons. Of the Hystricinæ the best-known species is the common porcupine (*Hystrix cristata*) of the Mediterranean region. It is one of the largest of rodents, being from 2 to 3 feet in length, besides the tail, which is about 6 inches long. The occiput and the neck are furnished with a crest of long, erectile bristles. The muzzle and limbs are covered with very short hair; the back and sides with spines, which on the middle of the back are almost of the thickness of a goose quill, and more than a foot long. The spines are supported by a slender pedicle, terminate in a sharp point, and are ringed with black and white, which gives a general gray color to the animal. Their ordinary position is flat, with the points directed backward; but when the animal is excited they are erected, giving the beast the bristling appearance shown in the accompanying plate. It can roll itself up like a hedgehog, with spines pointing in every direction. The spines or quills at the tip of the tail are of very singular structure, being open thin-sided tubes, about 2 inches long, supported upon slender flexible pedicles, and they make a sound by rattling together when the tail is shaken. The animal is solitary and nocturnal, burrows in the ground, and in winter becomes torpid. It feeds on roots, bark, fruits, and other vegetable substances, sometimes committing dep-



LOWER TEETH OF A PORCUPINE.

Showing the method of growth of the great incisor, reaching back beyond the roots of the molars; the hinder end is cut away to expose the pulp and pulp cavity.

redations in gardens. The spines or quills of this as well as of other porcupines are used for various purposes and have a certain commercial value. A larger species of porcupine (*Hystrix leucurus*), with the quills of the tail quite white, is found in India, and other species inhabit different parts of Asia and Africa. The Malayan and West African brush-tailed porcupines of the genus *Atherura* differ from the true porcupines in having the quills flattened like blades of grass and those of the tail gathered into a tuft at the end of it.

Of the other subfamily, the Sphingurinæ, the best-known species is the North American porcupine (*Erethizon dorsatum*) of the forested parts of Canada and the northeastern United States. It is about 2½ feet long, the tail adding about 6 inches more. The spines are only 2 or 3 inches long, yellowish white, mingled with black hair, giving the animal a black and white color. The spines are largest along the sides of the broad, flat tail. The Canada porcupine is often seen on the ground, where it makes a home among the rocks, or in a hollow stump, but spends most of its time in trees, especially evergreens. It is harmless and inoffensive, but is able to resist attack well, not only by its armature of quills, but also by powerful strokes of its tail, and feeds on bark, buds, leaves, fruit, etc. The flesh of the young ones is very good. A closely allied species, the yellow porcupine, is found in the West. The other species of this subfamily are small strictly arboreal species, with more or less prehensile tail, found in Mexico and South America. They are called tree porcupines and belong to the genera *Sphingurus*, which has short spines, and *Chætomys*, in which the body is clad with stout, wavy bristles. Consult: C. H. Merriam, *Mammals of the Adirondacks* (New York, 1893); Ernest Ingersoll, *Wild Neighbors* (ib., 1898); E. T. Seton, *Life-Histories of Northern Animals* (ib., 1909); Stone and Cram, *American Animals* (new ed., ib., 1914).

PORCUPINE FISH. One of a family, Diodontidæ, of the family Plectognathi, allied to the globefishes, Tetraodontidæ, from which they differ chiefly in the stronger armature of the skin and in having no division in the bony plate of either jaw. They are short and broad in form and are covered everywhere with spines, each rooted upon a bony base, and in some species with strong, hairlike bristles. Each jaw is covered with a bony plate, like a beak of a bird, and the nostrils form small tentacles. They are sluggish fishes, inhabiting warm seas of various parts of the world and living on the bottom among weeds and corals. When disturbed they swallow air and float belly upward on the water, but their capacity of inflation is much less than that of the globefishes. They are generally regarded as poisonous, and therefore are rarely used as food, but are often utilized as curiosities. The best-known species is *Diodon hystrix*, common everywhere in the tropics, and often taken in Florida, where its Spanish name is erizo. (See Plate of Plectognath Fishes.) It reaches a length of about 3 feet. Another smaller and darker species of these fish is *Diodon holacanthus*, also well known. An allied species, *Chylomycterus schoepfi*, only 6 to 10 inches long and very abundant in the bays and lagoons from Virginia to Florida, swells up when touched, after the manner of the northern puffers. It is greenish in color, with the abdomen paler, the back and sides marked by round black spots and parallel black stripes. Its common names are bur fish, rabbit fish, and swelled toad.

PORCUPINE RIVER. The most important of the northeastern affluents of the Yukon, into which it flows at Fort Yukon (Map: Alaska, L 1). It is navigable for about 100 miles by steamboats and 200 by poling boats. Through a portage to Peel River it affords the best route to the lower Mackenzie River.

PORCUPINE WOOD. The wood of a palm. See Coconut.

PORDENONE, pŏ̇r′dȧ̆-nō′nȧ̆. A town in the Province of Udine, Italy, on the Noncello, 29 miles southwest of Udine (Map: Italy, D 2). Ruins of its old walls and of an ancient castle still remain, and the cathedral contains notable frescoes by Pordenone, the painter, who was born here in 1483. There are manufactures of cotton, linen, and silk fabrics, paper, and earthenware, and a trade in wine and grain. The site is supposed to be that of the Portus Naonis of the Romans. Pop. (commune), 1901, 12,482; 1911, 13,756, (town), 8400.

PORDENONE, Giovanni Antonio da (1483–1540). A Venetian painter of the High Renaissance. He is sometimes wrongly called Licinio. His family name was Sacchi, and he usually called himself Pordenone, after his native town in Friuli. He studied probably under Alvise Vivarini, but developed his style under the influence of Giorgione and Titian and painted in the churches of Friuli as early as 1504. Although he lived mostly in Pordenone, he received many commissions in other cities. In 1521–22 he assisted in the decorations of the cathedral at Cremona and in 1528 was employed to decorate the church of San Rocco in Venice, where he settled definitely in 1535, having been previously knighted by the King of Hungary, and assumed the name of Regillo. At the invitation of the Duke, Pordenone in 1538 went to Ferrara, where he died suddenly in January, 1540. His most important works are frescoes and portraits, although he executed many altarpieces. Most of his paintings have suffered much from age and restoration, but the altarpiece in Sant' Elemosinario, Venice, still retains some of its richness and beautiful coloring. His most important frescoes, besides those already mentioned, are in the church of San Salvatore in Castel Coralto, in the cathedral at Treviso, dated 1520, in the Madonna di Campagna at Piacenza, and in the Duomo at Pordenone. Although not ranking with the greatest Venetian masters, Pordenone possessed great force, a sense of the decorative, and dramatic power. His portraits are broad in execution and original in color. Among the best of these are "The Ottoboni Family with the Madonna of Carmel and Saints" and the "Portrait of a Lady," in the Venice Academy.

PORE. See Skin.

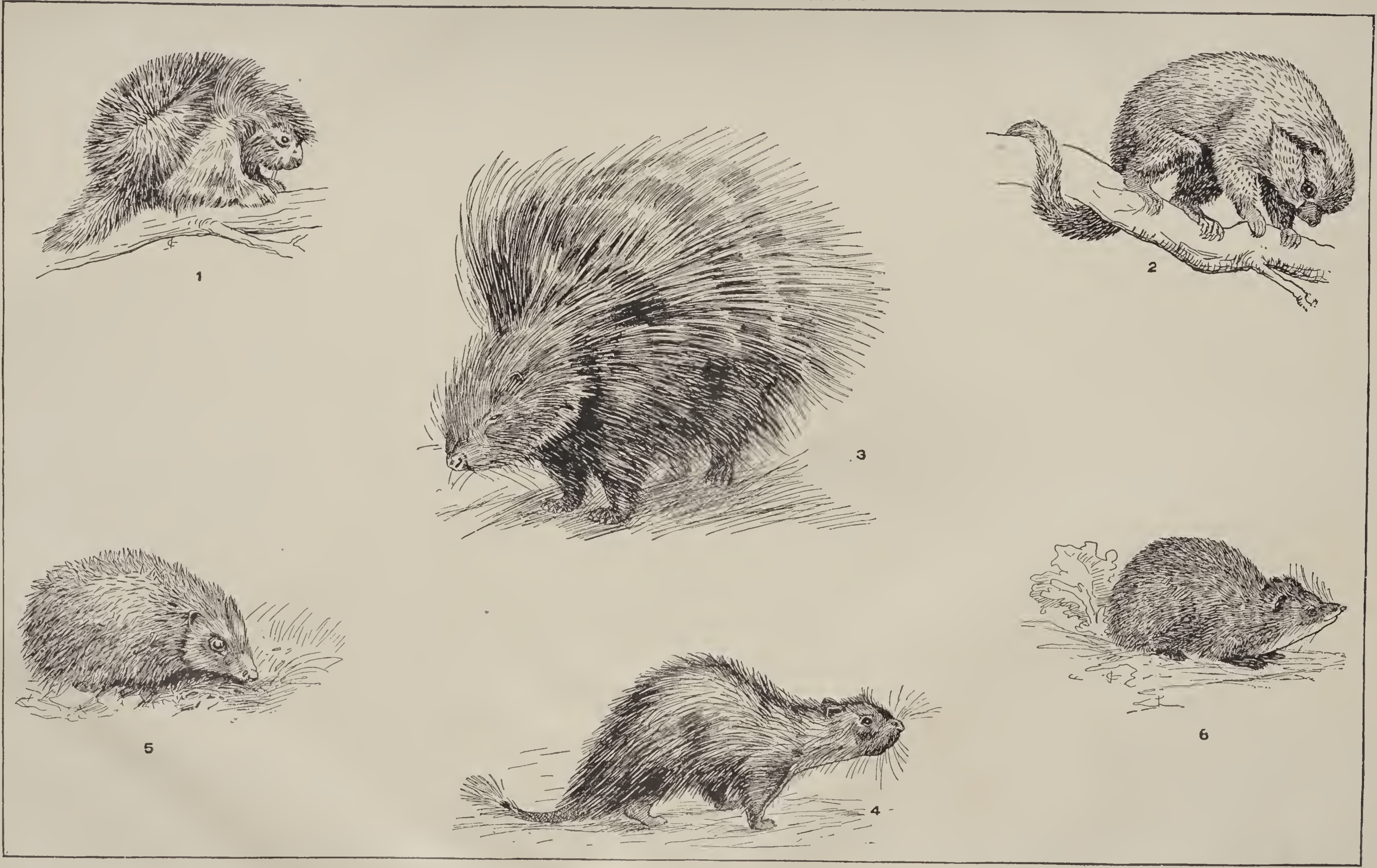
PORE FUNGI. See Basidiomycetes.

POREL, pŏ̇′rĕl′, Madame. A French actress. See Réjane, Madame.

PORFIRIO DÍAZ, pôr-fē′rē̇-ō̇ dē′ȧs, Ciudad. A town of Mexico. See Ciudad Porfirio Díaz.

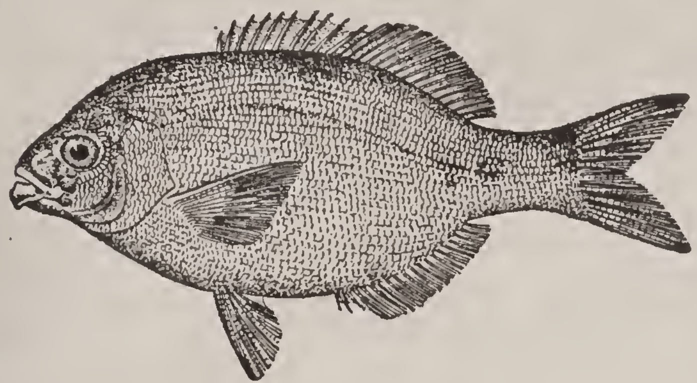
PORGY, or **PORGEE** (corrupted from American Indian *mischcuppauog*, or from Lat. *pagrus*, *pager*, from Gk. *πάγρος*, *pagros*, sea bream). Any of several fishes of the family Sparidæ. They are carnivorous shore fishes of the tropical seas, abundant in American and European waters, and are excellent food fishes. The common American porgy (*Stentotomus chrysops*) is

PORCUPINES AND HEDGEHOGS



1. NORTH AMERICAN PORCUPINE (Erethizon dorsatum).
2. BRAZILIAN TREE PORCUPINE (Chaetomys subspinosus).
3. EUROPEAN PORCUPINE (Hystrix cristata).
4. AFRICAN BRUSH-TAILED PORCUPINE (Atherura africana).
5. EUROPEAN HEDGEHOG (Erinaceus europæus).
6. TENDRAC OF MADAGASCAR (Ericulus spinosus).

more commonly known as scup (q.v.) along the Atlantic coast of the United States, and several allied species occur about Florida and the West Indies and are marketed locally. The European red porgy (*Pagrus pagrus*), known in the Mediterranean as besugo and pargo colorado, attains a length of about 2 feet and is common on the European coasts and also in the Gulf of Mexico and southward, where it is highly valued.



CALIFORNIAN PORGY (*Damalichthys argyrosomus*).

On the Pacific coast the name is given to one of the Californian surf fishes (see Surf Fish), otherwise known as white perch (*Damalichthys argyrosomus*). Consult J. S. Kingsley, in *Standard Natural History*, vol. iii (Boston, 1885). See Margate Fish.

PORIF′ERA (Neo-Lat. nom. pl., from Lat. *porus*, Gk. *πόρος*, pore, passage + Lat. *ferre*, to bear). The second or next to the lowest phylum of animals—the sponges; also its single constituent class. See Sponge.

PO′RISM (from *πόρισμα*, *porisma*, corollary, from *πορίζειν*, *porizein*, to bring about, deduce, from *πόρος*, *poros*, passage; connected with Lat. *peritus*, skilled, OChurch Slav. *perïti*, to fly, Skt. *par*, to cross over, Goth., OHG., AS. *faran*, Ger. *fahren*, Eng. *fare*). A kind of geometric proposition common in Greek mathematics. The word seems to have been loosely employed, Proclus (q.v.) telling us that it is used in geometry to designate either a corollary or a proposition which partakes of the nature of both a theorem and a problem. The most ancient tradition divides propositions into theorems, problems, and porisms, according as it is required to demonstrate, to do, or to find. Thus, "To construct an equilateral triangle on a given line" is a problem; "To find the centre of a given circle" is a porism. The term "porism" was also used by Diophantus with reference to certain propositions in arithmetic. Consult: Chasles, *Les trois livres de porismes d'euclide* (Paris, 1860); James Gow, *Short History of Greek Mathematics* (Cambridge, 1884); Chasles, *Aperçu historique* (3d ed., Paris, 1889); T. L. Heath, *The Thirteen Books of Euclid's Elements*, vol. i (Cambridge, 1908).

PORK (OF., Fr. *porc*, from Lat. *porcus*, swine, hog, pig). The flesh of swine. This meat is widely used and extensively exported for food and is valued for its pleasant flavor and the many ways in which it can be prepared for the table, the good keeping qualities of certain pork products, such as ham and bacon, as well as for the protein it supplies and its relatively high energy value, especially fat pork, and for the ease with which it may be preserved by salting, drying, or smoking. The pork-packing industry has grown to enormous proportions in the United States. In 1909 there were slaughtered in that country 33,870,616 hogs, valued at $483,383,848. The flavor of pork is affected more or less by the feed given to the pig, as is also the character of the fat. Fat with a low melting point is characteristic of soft pork, while a higher melting point is found in that of better quality. Acorns are believed to cause the peculiar and delicate flavor noticed in the flesh of pigs which are allowed to run where they have access to them. The overfat carcass is now quite generally recognized as undesirable, and smaller pigs with fat and lean well distributed are more satisfactory. Pork contains on an average more fat than other meats, but does not differ from them markedly in other respects as regards composition or thoroughness of digestion. It is often said that pork is unwholesome, but this seems to be wholly a matter of opinion, since so far as scientific food experiments go there is nothing to show that good pork is less desirable for men in health than other meats. It is very likely that much of the prejudice against pork comes from the fact that it is one of the foods avoided by the Jews and Mohammedans on account of their respective religious beliefs. See Food; Ham; Meat; Packing Industry.

POROG′AMY. See Chalazogamy.

POROMUSHIR, pō′rō-mo͞o-shēr′. One of the Kurile group of islands. See Kurile Islands.

POROS′ITY (from Lat. *porosus*, full of pores, from *porus*, pore, passage). A term expressing the experimental fact that no kind of matter completely fills the space it occupies; in other words, that all bodies are full of minute cavities or interstices, such as are illustrated on a large scale by a sponge.

PORPHYR′IO, or **PORPHYRION**, Pomponius. A Latin grammarian, of the third century A.D. His commentary on Horace is the most valuable that has come down to us, though it is sometimes fanciful and is frequently marred by interpolations made by mediæval clerks. It was edited by Meyer (1874) and by Holder (1894). Consult Martin Schanz, *Geschichte der römischen Litteratur*, vol. iii (2d ed., Munich, 1905), and W. S. Teuffel, *Geschichte der römischen Literatur*, vol. iii (6th ed., Leipzig, 1913). See Helenius Acro.

PORPHYR′ION (Lat., from Gk. Πορφυρίων). In Greek mythology, a giant destroyed in the combat with the gods because at the sight of Juno's beauty he forgot to defend himself. See Giants.

PORPHYRIT′IC TEXTURE. See Igneous Rocks.

PORPHYR′IUS (in Eng. *Porphyry;* Lat., from Gk. Πορφύριος, *Porphyrios*) (233–c.304 A.D.). One of the most important Neoplatonists (see Neoplatonism) and the chief disciple of Plotinus (q.v.). He was born at Batanea in Syria, where he received his early education. His original name was Malchus (King), but this was changed, according to tradition, to Porphyrius (wearer of the purple; cf. Gk. *πορφύρεος*, *porphyreos*, purple) by Longinus (q.v.), whose disciple he was at Athens from 252 to 262. In 262 he went to Rome and soon attached himself to Plotinus. About 267 he moved to Sicily, but returned to Rome under Aurelian and continued his teaching into the reign of Diocletian. Porphyrius was not a deep thinker. He devoted himself to grammar and history as well as philosophy, but his great service was as an expositor and definer of Plotinus' obscure doctrines, which Eunapius declares he made clear to the common understanding. One of his pupils was Iamblichus (q.v.). He was a very prolific writer. Suidas (q.v.) has preserved to us an incomplete list of his writings, some of which deal with speculative philosophy, but most of them were devoted to the history of philosophy and its exposition. The most important of these are his *Life of Pythagoras*, his work *On Abstinence from Animal Food*, an *Introduction and Commentary to Aristotle's Categorics*, and a work addressed to his wife, Marcella. Of his lost works the most important was one directed against the Christians, which was publicly burned at the order of Theodosius II. That he was originally a Christian, as is stated by Socrates, the Church historian, and by St. Augustine, there is not the slightest proof. A complete edition of his works and fragments never has been published. The most important editions of single works are the following: *Porphyrii Opuscula Selecta*, by Nauck (2d ed., Leipzig, 1886); *The Life of Pythagoras*, together with Iamblichus' similar work, by Kiessling (ib., 1816); his *Commentaries to Aristotle's Categories* is now published in the great Berlin edition of the *Commentaries to Aristotle*, vol. iv, edited by Busse (Berlin, 1887); *Porphyrii de Philosophia ex Oraculis Haurienda Librorum Reliquiæ*, edited by Gustav Wolff (ib., 1856); *Quæstiones Homericæ*, edited by Schrader (Leipzig, 1880, 1890); *Sententiæ*, by B. Mommert (1907). There is a translation of *Select Works*, by Taylor (London, 1823), and of the *Sentences*, by Davidson (ib., 1869). Consult: Eduard Zeller, *Philosophie der Griechen* (3d ed., Leipzig, 1881); T. Whittaker, *The Neo-Platonists* (Cambridge, 1901); J. E. Sandys, *A History of Classical Scholarship*, vol. i (2d ed., ib., 1906); Christ-Schmid, *Geschichte der griechischen Litteratur*, vol. ii, part ii (5th ed., Munich, 1913). For Porphyrius' relation to Christianity: A. J. Kleffner, *Porphyrius der Neuplatoniker und Christenfeind* (Paderborn, 1896).

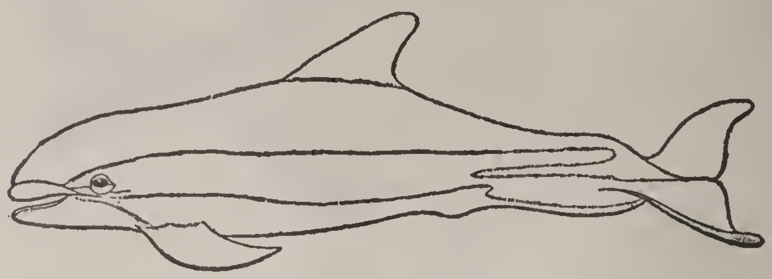
PORPHYROGENITUS, CONSTANTINE. See CONSTANTINE PORPHYROGENITUS.

POR'PHYRY (OF., Fr. *porphyre*, from Gk. πόρφυρος, *porphyros*, purple, from πορφυρά, *porphyra*, purple fish). A term formerly much employed to designate in a general way any rock of porphyritic texture (see IGNEOUS ROCKS), and in a special sense such rocks when of siliceous composition and having the larger crystals (porphyritic crystals) chiefly of orthoclase feldspar or orthoclase feldspar and quartz. Thus, quartz porphyry included the finer-grained granites occurring as bosses or dikes.

PORPHYRY. See PORPHYRIUS.

PORPHYRY DEPOSITS. See COPPER.

POR'POISE (OF. *porpcis*, *porpois*, *pourpois*, dialectic Fr. *pourpeis*, from Lat. *porcus*, swine, hog, pig + *piscis*, fish; cf., with reversed order of components, Portug. *peixe porco*, OIt. *pesce porco*, porpoise). A small active cetacean, of the family Delphinidæ, having a form similar to the dolphins, but the muzzle short, uniformly convex, and without a beak; a dorsal fin; the teeth numerous, simple, and equal. The common porpoise (*Phocæna communis*) is plentiful in all northern seas and is only 6 to 8 feet in length. The body is spindle-shaped, the skin perfectly smooth and destitute of hair, and there are from 40 to 50 teeth in each jaw. The eye is rather small, with the pupil in the form of a V, and the opening of the ear is very minute. The crescent-shaped blowhole is situated between the eyes. Large numbers are often seen together, sometimes gamboling, sometimes swimming in file, when their backs, appearing above the surface of the water, are likely to suggest the idea of a great sea serpent. They feed on fish and pursue the herring, mackerel, etc., into bays and estuaries. The porpoise sometimes ascends rivers, apparently in pursuit of salmon, as far as the water is brackish, and is not infrequently caught on such occasions, for the sake of its skin, oil, and flesh. The skin is nearly an inch thick, but is planed down until it becomes translucent, and is made into excellent leather, which is used for shoestrings and for other purposes. Under the skin is a layer of fat, about an inch in depth, which yields oil of the finest quality. The flesh was in former times highly esteemed, but it is now little eaten by civilized people. Several other species of *Phocæna* occur in the South Atlantic, Indian, and Pacific oceans, while the name "porpoise" is carelessly extended to almost any of the smaller dolphins. Consult: G. B. Goode, *Fishery Industries*, sect. i (Washington, 1884); F. W. True, in *Bulletin of the United States National Museum, No. 36* (ib., 1889); F. E. Beddard, *A Book of Whales* (London, 1900).



SKUNK, OR BAY, PORPOISE.

POR'PORA, NICCOLÒ ANTONIO (1686–1766). An Italian composer, born at Naples. He studied music under Padre Gaetano, of Perugia, and under Mancini. He produced his first opera, *Agrippina*, in 1708. *Berenice* followed in 1710. He began the work for which he subsequently became famous in 1712, when he founded the music school in Naples, which numbered among its pupils Farinelli, Tosi, Senesino, and Caffarelli. He held many important appointments in Austria, Prussia, and Italy, and in 1728 became singing master to the royal family at Dresden, in which city he also became concert master of the opera. The following year he was invited to go to London, where a considerable opposition had been organized against Handel (q.v.). Although some of his best work was written and produced in London, he could not succeed against his rival, and returned in 1736 to Venice, where he was appointed director of the conservatory. After a period of about nine years he went to Vienna in the train of the Venetian Ambassador, and during the three years of his stay was held in high repute as a teacher, Haydn studying under him part of the time. He went to Dresden in 1748, where he became court kapellmeister, and returned to Naples in 1755. From 1760 until his death, which occurred at Naples, he was maestro at the cathedral and director of the Conservatory Sant' Onofrio. He wrote more than 50 operas; also six oratorios, many masses, and much other sacred music.

PORRAS, pŏr'räs, BELISARIO (1860–). A Panaman politician, born in Panama. He was educated in Bogotá and Brussels, and afterward served as counsel for the French Canal Commission and as professor of international law in the universities of San Salvador and Managua. Entering public life, he was a judge of the Supreme

Court and later was Colombian Consul General in Belgium. In 1907 he was a delegate to The Hague Conference from Panama, and in 1910 was appointed Minister to the United States, where he served one year. Returning to Panama, he entered politics and was elected President in 1912. He endeavored to give the country an efficient administration.

POR′REX. See GORBODUC.

PORRO, pôr′rō, EDUARDO (1842–1902). An Italian obstetrician. He was born in Padua and took his M.D. in 1865 at the University of Pavia, where, after spending several years as assistant at the Ospedale Maggiore at Milan, he became professor of obstetrics (1875). From 1885 to 1902 he held a similar chair at Milan. Porro improved the so-called Cæsarean operation by excision of the uterus and annexa, described in *Della amputazione utero-ovarica come complemento di taglio cesareo* (1876), the best known of his writings.

POR′SENA, or **PORSEN′NA,** LARS. In the early and uncertain history of Rome, a powerful King of Clusium (now Chiusi, q.v.) in Etruria. According to the legend told by Livy, when Tarquin the Proud was expelled from Rome he sought the help of his Etruscan kinsmen, in Veii and Tarquinii, against his revolted subjects; but, their efforts not proving successful, he turned to Porsena, who willingly espoused his cause, and marched with a great army against Rome. The Etruscan King seized the Janiculum, a fortified hill on the west side of the Tiber, and would have forced his way into the city across the Bridge of Wooden Piles (*pons sublicius*), had not a brave Roman, Horatius Cocles, kept the whole of Porsena's army at bay while his comrades behind him hewed down the bridge (see HORATII), after which he plunged into the Tiber and safely swam across it. Porsena now laid siege to Rome, and after a while the inhabitants began to suffer so severely from famine that they had recourse to a desperate expedient. Three hundred of the noblest Roman youths swore to risk their lives in an attempt to assassinate the Etruscan King. The first on whom the lot fell was C. Mucius, who stole into the camp of Porsena, but, not knowing the King, killed his secretary instead. He was instantly seized and put to torture; but the unshrinking audacity with which he thrust his hand into the fire and let it burn moved the King so much that he pardoned him, whereupon Mucius, ever afterward called Scævola (the left-handed), told him of the jeopardy in which he was placed.

Porsena resolved to make peace with Rome at once, and his conditions being accepted by the sorely pressed citizens, he withdrew his forces. This version of the story is believed by many scholars to have been invented to conceal the fact of a temporary Etruscan conquest of Rome, and the evidence in favor of this view is overwhelming. Tacitus expressly affirms that Porsena conquered the city; Dionysius informs us that the Senate sent him an ivory sceptre, a golden crown, and a triumphal robe, which was the form that had been adopted by the Etruscan cities themselves of acknowledging the supremacy of the Roman King, Tarquinius Priscus; and Pliny mentions that Porsena forbade the citizens of Rome to use iron except for agricultural purposes. What seems most reasonable to believe is that a great rising of the Etruscan races against the Latin took place and that Rome was exposed to the first brunt of the war and suffered a disastrous defeat, but that shortly afterward the Etruscans themselves were decisively beaten and were forced back into their own territories; for, after the conquest of Rome, Aruns, a son of Porsena, proceeded against Aricia, under the walls of which city (according to Livy) his army was routed by the combined forces of the Latin cities, with the help of Greek auxiliaries from Cumæ. Consult: Livy, ii, 9–15; Dionysius of Halicarnassus, *Antiquitates*, v, 21–34; G. Lewis, *Inquiry into the Credibility of Early Roman History* (London, 1855); A. Schwegler, *Römische Geschichte* (2d ed., 1867–73); E. Pais, *Storia di Roma*, vol. i (Rome, 1898–99).

POR′SON, RICHARD (1759–1808). A brilliant Greek scholar, born Dec. 25, 1759, at East Ruston, Norfolk, England, where his father, a worsted weaver, was parish clerk. The curate of the parish, Mr. Hewett, impressed by the boy's rare abilities, had him educated along with his own sons. Porson afterward found a patron in Mr. Norris, the founder of the Norrisian professorship at Cambridge, who, in 1774, sent him to Eton, where he remained about four years, but without distinguishing himself. Another patron, Sir George Baker, sent him in 1778 to Trinity College, Cambridge, of which he was elected a scholar in 1780. In 1781 he won the Craven scholarship and the first chancellor's medal. In 1782 he was chosen a fellow of Trinity. He now began to give indications of his subtlety and taste in the difficult verbal criticism of the Greek dramatists. For four years he contributed to *Maty's Review*—his first critique being on Schutz's Æschylus and his finest on Brunck's Aristophanes. He opened also a correspondence with Professors Ruhnken, Heyne, and Hermann. In 1787 he contributed to the *Gentleman's Magazine* three sarcastic letters on Hawkins's *Life of Johnson.* For the same periodical he wrote also his far more famous and trenchant *Letters to Travis on the Three Witnesses* (1788–89). The question concerned the disputed text 1 John v. 7, and was occasioned by a pretentious defense of the passage by Archdeacon Travis against the scornful attack of Gibbon. Porson definitely proves the verse to be spurious, and naturally incurred great odium on account of the side he took in this controversy. Since Porson's fellowship was vacated by his refusal to take orders, his friends now procured for him an annuity of £100. He was also elected, in 1792, to the regius professorship of Greek in the University of Cambridge, an office worth £40 a year. This place he held till his death. The only thing he ever did in connection with his Greek professorship was to deliver a Latin prelection on Euripides, written, it is said, in two days. In 1795 he edited the plays of Æschylus for the Foulis Press at Glasgow; between 1797 and 1801 he edited four plays of Euripides, the *Hecuba*, the *Orestes*, the *Phœnissæ*, and the *Medea.* He also collated the Harleian manuscript of the *Odyssey* for the Grenville Homer. In 1806 he was appointed librarian of the London Institution, with a salary of £200, but neglected his duties. By this time Porson had weakened in mind and body. Ever since the loss of his fellowship, he had lived mostly in London, occupying rooms at Essex Court in the Temple. There he would confine himself to work for days; and for years he was at times a hard drinker. He was likewise remarkable for personal peculiarities that are duly chronicled by his biographers. He died of apoplexy, Sept. 25, 1808, and was buried in the chapel of Trinity College, Cambridge.

Porson was famed for his wit and learning and, unfortunately, for the negligence with which he treated persons to whom he owed courtesy. His burlesque of Hawkins has been compared with Thackeray at his best. He certainly was a master of irony. His contributions to the knowledge of Greek syntax and metres are solid and permanent. To the emendation of texts he brought rare keenness and a marvelous memory. Though more scientific methods now prevail, especially in textual collation, it is generally agreed that Porson opened the way to the new era. The Greek type which is now in general use was copied and cast from Porson's elegant script and is known as the Porsonian type. After his death several works left in manuscript were published: *Ricardi Porsoni Adversaria* (1812), *Tracts and Miscellaneous Criticisms* (1815), *Pausanias* (1820), *Lexicon of Photius* (1822), *Notes on Suidas* (1834), *Correspondence*, edited by Luard (Cambridge, 1867). Consult: J. S. Watson, *Life of Richard Porson* (London, 1861); H. J. Nicoll, *Great Scholars* (Edinburgh, 1880); J. E. Sandys, *A History of Classical Scholarship*, vol. iii (Cambridge, 1908); Tompkins, *The Tragedy of Porson* (London, 1911); H. T. Peck, *A History of Classical Philology* (New York, 1911).

PORT. In English and American law, a haven or harbor for ships, with wharves, warehouses, etc., for the lading and unlading of goods and their safe custody, and with certain rights or privileges, as the right to collect tolls for the use of the same. Ports are the *ostia regni*, or gates of the realm, and every public port is a franchise, i.e., lies within the royal prerogative and cannot lawfully be set up by a subject or private citizen without charter from the crown or state. This restriction is due to two facts: first, that a port is always established in public waters, viz., a bay of the sea or a tidal river; and, second, that it involves the right to levy tolls and duties which can pertain only to the crown, or state, and which cannot be exercised by a subject except under a franchise from the crown. Even where a subject happens to be the owner of the soil where it is established, he cannot make a port without such franchises. When once set up, whether by public authority, as is now usually the case, or by a private citizen or corporation acting under a grant or franchise, a port is open to all vessels in times of peace, and must be maintained in good order and kept free from hindrances to navigation. The crown, or state, also has the right to exercise a general superintendence over it and to make and enforce regulations for the purpose of preserving the public peace, health, and safety. Formerly in England the privilege, or franchise, of setting up a port was occasionally granted to a subject, but in that country, as in the United States, ports are now invariably public institutions, set up and administered by the state. Consult Sir William Blackstone, *Commentaries on the Laws of England* (4th Amer. ed., 2 vols., Chicago, 1899), and S. A. Moore, *History of the Foreshore* (London, 1888). See HARBOR; PORT OF ENTRY.

PORT (of uncertain etymology). 1. A naval term to denote the left side of a vessel to an observer looking forward. See HELM. 2. In architecture the term "port" is used as an equivalent of portal (q.v.).

POR'TA, CARLO (1776–1821). An Italian poet, born in Milan. He was employed in the Bureau of Finance in Venice and afterward in Milan. Manzoni, Grossi, and others of the Romantic school in Milan were his intimate friends. He is the best poet in the dialect of Milan and one of the most interesting of the dialect writers of Italy. His works and a biography appeared in Milan in 1821.

PORTA, GIACOMO DELLA (1542–1604). An Italian architect, born at Milan. He was the pupil of Vignola and Michelangelo and completed various works left unfinished by both his masters. The most important of these was the cupola of St. Peter's in Rome, the original profile of which he altered slightly after the death of Michelangelo in 1564. He designed also the mosaics of the interior of the dome. Other building work of his in Rome includes the completion of the church of Il Gesù, begun by Vignola; the Farnese palace, begun by Michelangelo; the Greek church, in the Via Babuino; the church of the Madonna dei Monti; the façade of the church of San Luigi de' Francesi; and the palaces Paluzzi, Chigi, Serlupi, and d'Este. He built also in Rome some fine fountains, in which his taste for the decorative in architecture showed itself. Of these an especially noted one is the Fontana delle Tartarughe. Other works by Porta are the chapel of St. John the Baptist in the cathedral at Genoa and the Villa Aldobrandini, near Frascati.

PORTA, GIAMBATTISTA DELLA (1543–1615). An Italian savant, born at Naples. He traveled widely in Spain, France, and Italy, and founded an association known as *I Segreti*, for the purpose of carrying on scientific investigations. Accused of practicing magic, the society was dissolved by the Pope. Porta studied optics successfully and invented the camera obscura (q.v.). He wrote widely on scientific topics. His most important works are: *De Humana Physiognomia* (1586); *Magis Naturalis* (1589); *Ars Reminiscendi* (1602); *De Aëris Transmutationibus* (1609).

PORTA CAUCASIA, or CAUCASICA. See DARIEL.

PORTA COLLINA. See COLLINE GATE.

PORT ADELAIDE, ăd′e-lād. The port of the city of Adelaide (q.v.), South Australia.

PORT'ADOWN'. A town of Ireland in County Armagh, situated on the Great Northern Railroad, 5 miles south of Lough Neagh (Map: Ireland, E 2). It has manufactures of linen and cotton goods and trade in agricultural products. Pop., 1901, 10,046; 1911, 11,727.

PORTAELS, pôr-täls′, JEAN FRANÇOIS (1818–95). A Belgian historical and portrait painter, born at Vilvorde, near Brussels. He studied in the Academy of Brussels and in Paris under Paul Delaroche, and in 1842 he took the Prix de Rome. After extensive travels in the Orient, in 1847 he was appointed director of the Academy of Ghent. Later he opened a studio in Brussels, where his solid, practical teaching had great influence on the development of modern Belgian art. After further travels he became director of the Academy of Brussels in 1878. His early paintings are chiefly religious subjects, such as "The Daughter of Sion" and "Drought in Judæa" (Brussels Gallery). Later he painted genre pictures, including "Box in a Budapest Theatre" (ib.), portraits, and Oriental scenes, among the best known of which are "A Funeral in the Desert of Suez" and "Caravan in Syria Overtaken by a Simoom" (Brussels Gallery). His works are rather good in composition and possess grace and charm, but are painted in the smooth manner of the school of Delaroche.

POR′TAGE. A town in Livingston Co., N. Y., 62 miles by rail southeast of Buffalo, on the Erie and the Pennsylvania railroads (Map: New York, B 5). It is in an agricultural region producing chiefly beans, potatoes, and hay. Portage contains the beautiful Letchworth Park, presented to the State by William Pryor Letchworth in 1907. It covers about 1000 acres on both sides of the Genesee River. Attractive features are the three falls, with a combined descent of 340 feet, and a cañon whose walls rise to a height of 350 feet. Spanning the river near by is the Portage Bridge, 800 feet long and 234 feet high. There is also a museum in the town. Pop., 1900, 1029; 1910, 1273.

POR′TAGE. A borough in Cambria Co., Pa., 7 miles southeast of Ebensburg, on the Pennsylvania Railroad (Map: Pennsylvania, D 6). It is in a productive coal region, and coal mining is the chief industry. Pop., 1900, 816; 1910, 2954.

PORTAGE. A city and the county seat of Columbia Co., Wis., 93 miles by rail west by north of Milwaukee, on the government ship canal between the Fox and Wisconsin rivers and on the Minneapolis, St. Paul, and Sault Ste. Marie and the Chicago, Milwaukee, and St. Paul railroads (Map: Wisconsin, D 5). It has a public library, and among the prominent buildings are the high school and the city hall. Portage is the commercial centre of a productive farming region, and manufactures hosiery and knit goods, brick, flour, etc. The commission form of government was adopted in 1912. Portage was settled in 1835 and was chartered as a city in 1854, having been first incorporated two years earlier. Near the city limits are the remains of old Fort Winnebago, built in 1828. Pop., 1900, 5459; 1910, 5440.

PORTAGE LA PRAIRIE, pōr′tȧj lä prā′rĭ. A city and the capital of the Portage la Prairie electoral district, Manitoba, Canada, on the Canadian Pacific, Canadian Northern, Grand Trunk Pacific, and Great Northern railways, 56 miles by rail west of Winnipeg (Map: Manitoba, E 4). It possesses the district official buildings, courthouse, general hospital, home for incurables, provincial training school, Indian school, Old Folks Home, armory, and drill hall. It is a popular summer resort. Industrial establishments include flour and oatmeal mills, grain elevators, brick and lumber yards, steel grain bins, and manufactories of threshing machines, farm implements, corrugated-iron culverts, structural castings, pumps, sashes and doors. Pop., 1901, 3901; 1911, 5892; 1915 (local est.), 6500.

POR′TAL (OF. *portal*, Fr. *portail*, from ML. *portale*, entrance, vestibule, neut. sing. of *portalis*, relating to a gate, from Lat. *porta*, gate). A doorway or gateway and, by extension, the architectural composition which incloses and decorates such a doorway, or several doorways. The term is often applied to the lower part of the west front of a church or of the northern or southern transept front, in which the doorways are opened, or to any group of doorways at one front or flank of a building, with the architectural accessories, such as gables, canopies, columns, and the like. The porte-cochère of a large French building, i.e., the great doorway through which a carriage or wagon can be driven, is properly called a portal.

The portal and the porch (q.v.) are not to be separated absolutely; but in general the porch designates a sheltering structure external to the doorways, which with their architectural decorations form the portal or portals. In Oriental architecture the architectural treatment of the portal is usually extended to the top of the building, as often also in Spanish and in Elizabethan and Jacobean architecture.

PORTA LATINA. See Latin Gate.

PORTALEGRE, pôr′tȧ-lā′grȧ. The capital of the district of the same name in Portugal, situated near the Spanish frontier, 95 miles northeast of Lisbon (Map: Portugal, B 3). It is a fortified town and has a handsome cathedral. It manufactures woolen goods, and cork is obtained in the vicinity. Pop., 1900, 11,893; 1911, 11,603.

PORTALIS, pôr′tȧ′lēs′, Jean Etienne Marie (1746–1807). A French jurist and statesman, born at Bousset, near Toulon. He studied law at the University of Aix and in 1765 was admitted to practice before the provincial Parliament. Charged with a commission to investigate the legal status of the Protestants in France, he published in 1771 *Consultation sur la validité des mariages des protestants en France*, in which he established the character of marriage as a civil contract, the general tone of the work being wholly favorable to religious toleration. From 1778 to 1782 he was provincial assessor of Provence, returning subsequently to the practice of law. Always moderate in his views, Portalis retired to his estate when the Revolution entered upon its stormy phase. He was compelled to flee to Lyons and thence to Paris, where in December, 1793, he was arrested. He was liberated on the fall of Robespierre, and in 1795 was elected to the Council of Ancients, of which in June of the following year he became president. His clemency to the adherents of the old régime aroused the hostility of the Directors, and after the coup d'état of the 18th Fructidor (Sept. 4, 1797) he escaped deportation by seeking refuge in Switzerland. Returning in 1800, he was made by Napoleon a member of the commission charged with the preparation of a civil code. He took a most important part in the labors of the commission, for which he was peculiarly fitted by his extensive knowledge of the civil law. After the conclusion of the Concordat (1801) Portalis was intrusted with the task of formulating a body of supplementary rules to serve as a basis for the administrative policy of the state with regard to the Catholic religion. Made Minister of Public Worship in 1804, he effected important changes in the organization of religious instruction. In 1806 he became a member of the Academy. He died in Paris, Aug. 25, 1807, after an operation to cure total blindness, from which he suffered for two years. Consult C. A. Sainte-Beuve, *Causeries du lundi*, vol. v (Paris, 1852), and René Lavolée, *Portalis, sa vie et ses œuvres* (ib., 1869).

PORTAL VEIN. See Circulation; Liver.

PORTA MAGGIORE, pōr′tȧ mȧd-jō′rȧ. The ancient Porta Prænestina at Rome, a gate with two arches, one of which is now closed, through which issued the Via Prænestina and the Via

Labicana. It was originally designed to carry the aqueducts known as Aqua Claudia and Anio Vetus over the two roads. Its inscriptions record its construction and restorations. It was included as a gate in the walls of Aurelian. During the restoration of the walls by Arcadius and Honorius the level of its threshold was raised 10 feet by the leveling of the accumulated rubbish. Consult K. Baedeker, *Central Italy and Rome* (15th Eng. ed., Leipzig, 1909), and S. B. Platner, *The Topography and Monuments of Ancient Rome* (2d ed., Boston, 1911).

POR′TAMEN′TO (It., carriage). A musical term used to denote the sustaining of the voice in passing from one note to another. In legato the voice passes directly from one tone to the next, while in portamento it passes through all intermediate tones. But this passing is so rapid that no single tone is heard separately. The effect of portamento can best be attained upon a stringed instrument played with a bow. The finger quickly glides along the string from one note to the next.

PORTA NIGRA, pŏr′tȧ nī′grȧ (Lat., Black Gate). A famous gateway of Treves, dating probably from the fourth century A.D. It is constructed of sandstone and is blackened with age, whence its name. The gate was fortified with two towers, one of which was occupied early in the eleventh century by Simeon, a Greek hermit, and from this fact the gate is called also Simeonsthor.

PORT ANTO′NIO. A seaport town on the north coast of Jamaica (Map: Cuba, J 8). It is the second commercial town of the island and is the centre of the fruit trade. It is connected by rail with Kingston. Pop., 1911, 7074.

PORTA OSTIENSIS. See Ostiensis, Porta.

PORTA PRÆ′NESTI′NA. See Porta Maggiore.

PORT AR′THUR. A city, port of entry, the capital of the Thunder Bay district, Ontario, Canada, on Lake Superior and on the Canadian Northern and the Canadian Pacific railways (Map: Ontario, P 13). The city possesses a public library, an armory, a sailors' institute, district judicial buildings, and a Y. M. C. A. building. There are government, railway, and private grain elevators. Industrial establishments include blast furnaces, a shipbuilding company, railway coal and ore docks, lumber companies, cold-storage plants, and manufactories of bricks, tents, awnings, aërated waters, beer, etc. Pop., 1901, 3214; 1911, 11,220; 1915 (local est.), 18,500.

PORT ARTHUR (Chin. *Lushunkow*). A town and strongly fortified naval station near the Lao T'ich Shan promontory of the peninsular portion of the Manchurian province of Shingking or Fengtien (Map: China, M 4). The town lies on the slope of the high hills which surround the oval inlet which forms the harbor. The inlet on which it stands measures about 2 miles from east to west and 1 mile from north to south, and is well protected from storms by a spit of land which runs diagonally across its north end. The harbor proper has been much enlarged by blasting and dredging; new docks, barracks, an arsenal, and warehouses have been built and the place rendered impregnable. On the west side of the town is the terminus of the former Russian Railway to Harbin, now called the South Manchurian Railway since its lease by the Japanese. Pop., 1912, 17,884 (9637 Japanese, 8222 Chinese, and 25 foreigners). A regiment of Japanese soldiers is stationed here. See Manchuria.

Lushunkow was formerly only a small fishing village at the lower end of a long mountainous peninsula until it was selected by Li Hung Chang, under the advice of German engineers, for a strongly fortified naval station for the defense of the Pei-ho and Peking. In 1894, however, it was captured by the Japanese, and the Treaty of Shimonoseki provided for its cession to Japan with the whole south coast of Manchuria from the Liao to the Yalu; but Russia, France, and Germany intervened and induced Japan to relinquish all this territory for the sum of 30,000,000 taels, and on Nov. 30, 1895, its evacuation was begun. With adjacent territory it was leased by China to Russia for 25 years, in March, 1898. The object of Russia was to secure a naval station which she could defend for the use of her war vessels in Eastern waters, and the lease was granted with the distinct understanding that "it shall not prejudice China's sovereignty over the territory." It was further agreed that the port should be closed to all vessels except Chinese and Russian men-of-war. Strongly fortified, it became the chief Russian naval base in the Far East. It was invested by the Japanese in the Russo-Japanese War (q.v.) and surrendered Jan. 2, 1905. By the Treaty of Portsmouth, September, 1905, Port Arthur was ceded to Japan for the duration of the Russian lease. The lease was further extended in 1915. See Dalny; Shingking; Talienwan.

PORT ARTHUR. A city in Jefferson Co., Tex., 20 miles southeast of Beaumont, on the Kansas City Southern and the Texas and New Orleans railroads (Map: Texas, F 5). It is situated on various steamship lines and on the Intercoastal, the Port Arthur Ship, and the Sabine-Neches canals; has an important trade, being the port of entry of the Sabine district, the foreign commerce of which in 1914–1915 was valued at $30,097,548; it is the oil-refining centre for a vast territory, and there are rice-milling and horticultural interests. Among the noteworthy features of the city are the pleasure piers, parks, Sabine Lake, Port Arthur College, Mary Gates Hospital, and the Federal building. Port Arthur has adopted the commission form of government. Pop., 1900, 900; 1910, 7663; in 1915 it was nearly twice this figure.

PORTA SEBASTIANI, François Horace de la. See Sebastiani, F. H. de la Porta.

PORT-AU-PRINCE, pŏ̇r′tŏ̇′prăNs′, or Port Républicain. The capital and principal seaport of Haiti, West Indies, situated on the west coast of the island, opposite the island of Gonaïves (Map: West Indies, D 3). It lies in a marshy region and, although well laid out, is in a state of decline and unsanitary. It is built largely of wood and is partly in ruins as a result of the earthquakes of the eighteenth and nineteenth centuries. The principal buildings are the wooden palace, the Senate building, and the cathedral. The town contains also the mint, the customhouse, a lyceum, and a college. It has a United States consul. The harbor is safe and fortified. Pop. (est.), 1909, 100,000.

PORT CARBON. A borough in Schuylkill Co., Pa., 2 miles northeast of Pottsville, on the Schuylkill River and on the Philadelphia and Reading Railroad (Map: Pennsylvania, J 6). It is in a coal-mining region and has ironworks. Pop., 1900, 2168; 1910, 2678.

PORT CASTRIES. See Castries.

PORT CHESTER. A village in Westchester Co., N. Y., 26 miles northeast of New York City, on Long Island Sound and on the New York, New Haven, and Hartford Railroad (Map: New York, B 2). It enjoys considerable popularity as a summer resort and is also a residential suburb of New York. Among the noteworthy features are Monument Park, the Jared V. Peck Memorial Library, the United Hospital, and fine public school and bank buildings. The village has large nut and bolt works, foundries, planing mills, manufactures of shirts, boilers, gas stoves, medical supplies, etc. Port Chester was settled probably as early as 1742, and was known as Saw Pit until 1837, when the present name was adopted. It was incorporated as a village in 1868. Pop., 1900, 7440; 1910, 12,809; 1915 (State census), 15,129.

PORT CLARENCE. See Fernando Po.

PORT CLINTON. A village and the county seat of Ottawa County, Ohio, 35 miles by rail east by south of Toledo, on Lake Erie, at the mouth of the Portage River, and on the Lake Shore and Michigan Southern Railroad (Map: Ohio, E 2). It has a fine harbor and is the commercial centre of a region engaged largely in fruit growing. There are also large lime, plaster, and stone interests and manufactories of boats, ice, and crayons. The mining of gypsum, basket making, fishing, and canning are carried on. Pop., 1900, 2450; 1910, 3007.

PORTCUL′LIS (OF. *porte coleïce, porte coulisse,* sliding gate, from *porte,* from Lat. *porta,* gate, and *coleïce, coulisse,* fem. of *coleïs, coulis,* sliding, from Lat. *colatus,* p.p. of *colare,* to flow, to strain, from *colum,* sieve). A frame of iron, or of wood strengthened with iron, made in the form of grating, designed to slide in vertical grooves built in the jambs of the entrance gate of a fortified place, in order to defend the gate in case of assault. The vertical bars were pointed with iron below, and struck on the ground when the grating was dropped. (See Castle.) Portcullis is the title of a pursuivant in the English college of arms, whose office was instituted by Henry VII.

PORT DE PAIX, pôr de pȧ. A town and port of Haiti, on the Tortuga Channel, 100 miles north of Port-au-Prince, and on the right bank of the Trois Rivières at its mouth (Map: West Indies, D 2). The agricultural interests of the section are largely devoted to coffee. Columbus visited the port in 1492. It was taken by French filibusters in 1665. Pop. (est.), 10,000.

PORTE, Sublime Porte, or Ottoman Porte. The name given to the Turkish government. The origin of this name is to be referred to the ancient Oriental custom of making the gates of cities and of kings' palaces places of assembly in connection with the affairs of government and of the administration of justice. In the Byzantine Empire this custom was adopted, and the term was transferred from the high gate of the Imperial palace to the government whose authority was there exercised. The Turks found the term in common use among the Byzantines some time previous to their establishment at Constantinople, and adopted it on the organization of their Empire. The use, among European nations, of the French term *sublime porte* (lofty gate) is accounted for by the fact that French is the language of European diplomacy. See Turkey.

PORTE-COCHÈRE, pȯrt′-kȯ′shâr′ (Fr. *porte,* door + *coche,* coach). A French term commonly used in English to designate a carriage porch, i.e., a porch or shelter projecting from a building in such fashion as to allow carriages to be driven up to the entrance under cover. The original French term has, however, a quite different meaning. It signifies a door, doorway, and passage arranged to permit carriages to drive through from the street to the interior court. One leaf of the door is usually provided with a smaller opening and door which can be opened for pedestrians when the great main doors are closed.

PORTE CRAYON (Fr., pencil holder). The pseudonym of David H. Strother (q.v.).

PORTE DU THIEL, François Jean Gabriel. See La Porte du Thiel, F. J. G.

PORT ELIZ′ABETH. The largest and most important city of Cape of Good Hope Province next to Cape Town. It is situated on Algoa Bay 400 miles east of Cape Town, on the barren peninsula of Cape Recife (Map: Cape of Good Hope, G 10). It is a well-built city. There are fine, substantial public buildings and large commercial houses. There are also a college and other schools and a botanical garden, the latter irrigated from the city's water supply, which is brought over an aqueduct 28 miles long. The location of Port Elizabeth midway between Cape Town and Durban, and at the nearest point on the coast from Kimberley, with which it is connected by a railroad, gives the town great commercial advantages. The imports in 1914 were valued at $37,322,931, and the exports, chief of which were gold, diamonds, wool, ostrich feathers, and hides, at $15,290,757. Pop., 1911, 30,688 (18,190 whites).

POR′TEOUS RIOT. An uprising in Edinburgh on the night of Sept. 7, 1736. John Porteous, captain of the city guard of Edinburgh, was hated by the populace, and when on April 14, 1736, he superintended the execution of an Edinburgh merchant, Andrew Wilson, who had robbed a customhouse, disturbances were feared, especially since the sympathy of the people was with smugglers and their allies. The mob remained quiet until Wilson was dead, and then some boys and a few adults, as was not unusual on such occasions, began to throw mud and stones. Porteous, without any warning, ordered his soldiers to fire into the crowd, but they were reluctant to do so until he threatened and fired himself. Six or seven persons were killed and 20 wounded. Porteous was brought to trial, found guilty, and condemned to death, although there were great discrepancies in the evidence against him. He, however, petitioned the government, and a reprieve of six weeks was granted. This aroused the people, and some men in disguise forced the jail on the night of September 7, took out Porteous and hanged him. As a result a bill was passed by Parliament which disqualified the provost of Edinburgh from holding any government office in the future, and fined the city £2000 for the benefit of the widow of Porteous. The participants in this riot never were discovered, but it was believed that persons of high social and official standing were connected with it. The plot of Sir Walter Scott's *Heart of Midlothian* turns upon some of the supposed happenings of the Porteous riot. Consult Andrew Lang, *History of Scotland,* vol. iv (New York, 1907).

PORTER. See BEER.

POR'TER, ALEXANDER (1786–1844). An American jurist, who remodeled the jurisprudence of Louisiana. He was born near Armagh, Ireland, came to America in 1801, was admitted to the bar in Nashville, Tenn., in 1807, and, removing to St. Martinsville, La., became a member of the Constitutional Convention in 1811. His greatest labor was as judge of the Supreme Court of the State (1821–33), when he helped in the establishment of a new legal code. As a Whig he served in the United States Senate (1834–37). Porter was a friend of the United States Bank scheme and of Texan independence, an advocate of the division of surplus revenues among the States, and an opponent of the abolition of slavery in the District of Columbia. Reelected to the Senate in 1843, he served there until his death.

PORTER, BENJAMIN CURTIS (1845–1908). An American portrait and figure painter. He was born in Melrose, Mass., was a pupil of Rimmer and Bicknell in Boston, and later studied at different times in Europe, especially in Venice and Paris. He opened a studio in Boston and afterward one in New York, making a specialty of portraits, which in their decorative quality, pose, and arrangement of costume are reminiscent of the French eighteenth-century painters. In tone they are warm and mellow. In 1880 Porter became National Academician. His earlier works include figure pieces such as "Henry V and the Princess Kate" (1868) and "Cupid with Butterflies" (1874). Among his portraits are "Lady with Dog" (1876) and "Boy with Dog" (1884).

PORTER, CHARLES TALBOT (1826–1910). An American mechanical engineer. He was born at Auburn, N. Y., graduated at Hamilton College in 1845, practiced law for several years, and then became an engineer, forming a partnership with John F. Allen to control the Porter-Allen engine. Porter was one of the first to compute the inertia forces of the reciprocating engine mechanism and therefore to use with success high rotative speed in stationary engines. He was the inventor of a central counterpoise governor for steam engines (1859) and of an isochronous centrifugal governor for marine engines (1861) and was the author of *Mechanics and Faith, Spiritual Truths in Nature* (1885), and *Engineering Reminiscences* (1908).

PORTER, CHARLOTTE (?–). An American editor and author, born at Towanda, Pa., and educated at Wells College (A.B., 1875). She was chosen an honorary member of the Browning Society and president of the American Drama Society. She edited *Shakespeareana* (1886–88); the *Ethical Record* (part of 1888); and founded and edited (with Helen A. Clarke) *Poet Lore*. Collaborations of hers with Miss Clarke are: *Poems of Robert Browning* (2 vols., 1896); *Clever Tales from the French, Russian, and Bohemian* (1897); *Browning's Complete Poetical Works* (Camberwell ed., 12 pocket volumes, 1898); *Mrs. Browning's Complete Works* (Coxhoe ed., 6 vols., 1900); *Shakespeare* (Pembroke ed., 12 vols., 1903); *Shakespeare Studies: Macbeth* (1901); *Shakespeare Study Programs: The Tragedies* and *The Comedies* (1914). She was sole editor of *The First Folio Edition of Shakespeare* (40 vols., 1903–11). Among her writings is *Playing Shakespeare's Plays in Shakespeare's Way* (1913).

PORTER, DAVID (1780–1843). An American naval officer. He was born in Boston, Feb. 1, 1780, the son of a naval officer in the Revolution. In 1798, after some experience on merchant vessels, in the course of which he was twice impressed by the British, but each time escaped, he entered the navy as a midshipman. In the following year he served on board the *Constellation* in her fight with the French frigate *L'Insurgente.* Being made a lieutenant in the following year, he served in the war with Tripoli, and in 1803 was captured with the *Philadelphia* and remained a prisoner until peace was made in June, 1805. He was commissioned master commandant in April, 1806; in 1807–10 he served about New Orleans, capturing several French privateers. In 1812 he was promoted captain.

During the first year of the War of 1812, as commander of the frigate *Essex*, 32 guns, he captured several English merchant vessels, a transport, and the corvette *Alert*, 20 guns. In the following February he entered the Pacific, and for almost a year preyed with great success upon the English whale shipping in that ocean. On his own authority Porter took formal possession (November, 1813) of the largest of the Marquesas Islands; in 1842, however, these islands were annexed by France. On this cruise he was accompanied by young David G. Farragut (q.v.), whom he had adopted in 1809. After inflicting much damage upon the enemy, the *Essex* was blockaded in the port of Valparaiso by two English vessels, the *Phœbe*, of 36 guns, and the *Cherub*, of 20 guns. Porter offered to fight either singly, but as this offer was refused, he made an attempt on the 28th of March to get to sea, with the result that in doubling a headland his vessel was struck by a squall, which carried away her fore-topmast and drowned several of her crew. Porter then returned to the harbor and anchored his vessel less than 3 miles from the town and only ½ mile from the shore. Here, disregarding the rules of neutrality, the British attacked her, and after a bloody and unequal conflict of two hours and a half forced her to surrender. Despite the loss of his vessel, however, Porter on his return home was received with great honors.

His career after the close of the war was varied. From 1815 to 1823 he was a member of the new Board of Naval Commissioners. In 1824, being now a commodore, he was sent in charge of an expedition against the West Indian pirates. In the performance of this duty he compelled the Spanish authorities at Fajardo, Porto Rico, to render an apology for an insult to his flag; for this action he was afterward court-martialed and, on the ground that he had exceeded his authority, was suspended from the service for six months. Disgusted with this treatment, he resigned and entered the Mexican navy as rear admiral. He remained in this service until 1829 and then, being dissatisfied with it, resigned. He was soon afterward appointed consul general to the Barbary Powers by President Jackson, and was later transferred as chargé d'affaires to Constantinople, where he died, March 3, 1843. Porter published a *Journal of a Cruise Made to the Pacifick Ocean by the United States Frigate Essex* (1815; 1822); a defense of his conduct at Fajardo (1825); *Constantinople and its Environs* (1835). Consult his son, D. D. Porter (q.v.), *Life of Commodore David Porter* (Albany, 1875).

PORTER, DAVID DIXON (1813–91). An

American admiral. He was a son of Commodore David Porter and was born in Chester, Pa., June 8, 1813. In 1824 he accompanied his father on his expedition against the West Indian pirates, and when his father became admiral of the Mexican navy he entered the same service as a midshipman. While serving under his cousin, Captain David H. Porter, who was in command of a Mexican vessel cruising against Spanish commerce, young Porter took part in a desperate engagement with a much superior Spanish frigate. The vessel on which he was serving was captured, and he was for a short time confined in the guard ship at Havana. Soon after his release he was commissioned a midshipman in the United States navy, and served until 1835 on the European station. Porter became a lieutenant in 1841, and served at the naval observatory in 1845–46. In 1846 he was sent by the Secretary of War on a secret mission to Haiti, and then served with distinction in the Mexican War as a lieutenant and afterward as commanding officer of the *Spitfire*. After the close of that struggle he obtained a furlough, and for some years commanded private passenger steamers.

The Civil War gave Porter the opportunity to distinguish himself. The beginning of that struggle found him a lieutenant on shore duty; in a little more than two years he was a rear admiral in command of a squadron. His first service in the war was to assist, as commander of the *Powhatan*, in the relief of Fort Pickens at Pensacola. Shortly afterward he was advanced to the rank of commander. A little later, largely through his recommendation, Farragut was given command of the West Gulf blockading squadron which was to operate against New Orleans, and Porter was put in charge of the fleet of bomb vessels under him. By Farragut's order Porter, in April, 1862, began a bombardment of Forts Jackson and St. Philip, which guarded the way up the Mississippi, and after six days and nights, in the course of which he threw into them more than 16,000 shells, he reduced them to such a condition that Farragut's fleet was able to pass them and capture New Orleans. Four days later the forts themselves surrendered to Porter. During the next few months he served with great credit in the operations between New Orleans and Vicksburg, his bombardment at the latter place assisting Farragut to run past the forts. In September, 1862, he was put in charge of the Mississippi squadron as acting rear admiral. He improvised a navy yard at Mound City, Ill., and soon increased his squadron of about a dozen effective vessels to more than 120 by converting ordinary river steamers into gunboats. With a part of this fleet he assisted the army in the capture of Arkansas Post in January, 1863, and next succeeded in running past the batteries of Vicksburg and reducing the Confederate forts at Grand Gulf. He then coöperated with General Grant in the siege of Vicksburg, and upon the surrender of that place received the thanks of Congress for "opening the Mississippi," and a commission as rear admiral. In the spring of 1864 he assisted General Banks in the disastrous expedition up the Red River, and it was only by the greatest exertions that he succeeded in saving his vessels. (See Bailey, Joseph.) In the same year he was put in command of the North Atlantic blockading squadron. While in this command his most important service was in coöperating in the capture of Fort Fisher, which was taken by assault on the 15th of January, 1865, after a long and destructive bombardment by his fleet. For this service he again received the thanks of Congress.

After peace came he served from 1865 to 1869 as superintendent of the Naval Academy at Annapolis, and did much to increase the efficiency of that institution. In 1866 he was promoted to be vice admiral, and in 1870, on the death of Farragut, was advanced to the highest of all naval ranks, that of admiral. He died in Washington, Feb. 13, 1891.

Admiral Porter wrote a life of his father (1875); *Incidents and Anecdotes of the Civil War* (1885); *History of the Navy in the War of the Rebellion* (1887); two novels, *Allan Dale and Robert le Diable* (1885) and *Harry Marline* (1866); a posthumous novelette, *A Romance of Gettysburg*, which appeared in the *Criterion* for 1903; and articles for various publications.

Consult: Johnson and Buel (eds.), *Battles and Leaders of the Civil War* (New York, 1887); J. E. Homans, *Our Three Admirals: Farragut, Porter, and Dewey* (ib., 1899); J. R. Soley, *Admiral Porter*, in the "Great Commanders Series" (ib., 1903).

PORTER, Endymion (1587–1649). An English Royalist. He was brought up in Spain, entered the service of the Duke of Buckingham, and became a groom of the bedchamber to Charles I. He accompanied Charles on his expedition to Spain in 1623, and was the faithful follower of the King during the Civil War. A member of the Long Parliament, Porter voted against Stafford's attainder, and later (1643) was expelled. From 1645 to 1649 he lived in France and the Netherlands. He was employed by Charles I in forming his great art collection, and was a friend and patron of the poets of his day.

PORTER, Fitz John (1822–1901). An American soldier. He was born at Portsmouth, N. H., Aug. 31, 1822, graduated at West Point in 1845, and was assigned to the artillery, in which he became second lieutenant the following year. He served in the war with Mexico from the beginning, was wounded in the attack on the city of Mexico, Sept. 13, 1847, and was brevetted captain and major for gallantry in the battle of Molino del Rey and the storming of Chapultepec, respectively. After the war he was sent to West Point, where he served as adjutant of the post and as instructor of artillery and cavalry. In 1856 he was transferred to the Adjutant General's Department, and was assistant adjutant general of the Utah expedition under Albert Sidney Johnston in 1857. On May 14, 1861, he received the appointment of colonel of the Fifteenth Infantry, was made brigadier general of volunteers in the same month, and served as chief of staff with General Banks and General Patterson until August, when he was put in command of a division in the Army of the Potomac. He had charge of the siege operations against Yorktown during the Peninsular campaign, acted as military governor of the place for a time after its evacuation, and was then given the command of the Fifth Army Corps, which fought the battles of Mechanicsville and Gaines's Mill and bore the brunt of the fight at Malvern Hill. He was appointed brevet brigadier general in the regular army for gallantry at the battles of the Chickahominy, and on July 4, 1862, was commissioned major general of volunteers. At the second battle of Bull Run his failure to move forward on the first day of the engagement led to his trial by court-martial on the charge of disobeying the orders of General Pope. He was found guilty and was cashiered and disqualified from holding any position of trust or profit under the United States government. The justice of the punishment was a subject of much controversy, and numerous attempts were made to secure a reversal of the verdict.

In June, 1878, a board of officers convened at West Point, by order of the President, to examine the evidence and to consider the findings of the court-martial. This board reported that, in the opinion of those forming it, justice required at the hands of the President of the United States "such action as may be necessary to annul and set aside the findings and sentence of the court-martial in the case of Major General Fitz John Porter, and to restore him to the position of which that sentence deprived him, such restoration to take effect from the date of his dismissal from office." This report was signed by the entire board, including Major General J. M. Schofield, Brigadier General Alfred H. Terry, and Brevet Major General George W. Getty. The report was laid before the House Committee on Military Affairs, and a majority of the committee, in January, 1881, reported a bill restoring him to his rank of major general in the United States army and requiring the Secretary of the Treasury to pay to him the sum of $75,000. The bill for his relief failed to pass, but President Arthur in 1882 remitted the disqualifying clause in his sentence. In 1886 a bill for his restoration to the army with the rank of colonel, but without back pay, was approved by the President, and soon afterward General Porter was retired.

After his return from the army General Porter engaged in business in New York City, where he afterward held several municipal offices, among them that of police commissioner and commissioner of the fire department. Until his death, which occurred May 21, 1901, at Morristown, N. J., he considered that he had been deeply wronged. Consult for the case against Porter, Cox, *The Second Battle of Bull Run as Connected with the Fitz John Porter Case* (Cincinnati, 1882); for a brief statement of the case in his favor: an article by Gen. U. S. Grant in *North American Review*, vol. cxxxv (New York, 1882); also Lord, *A Summary of the Case of F. J. Porter* (San Francisco, 1883).

PORTER, Gene Stratton (1868–). An American author and ornithologist, born in Wabash Co., Ind. In 1886 she was married to Charles Darwin Porter. She worked two years in the camera department of *Recreation*, two years on the natural-history staff of *Outing*, and four years for the *Photographic Times Annual Almanac*. Mrs. Porter used her own photographs in illustrating her books on birds. Some of her novels were widely popular. She wrote: *The Song of the Cardinal* (1902); *Freckles* (1904); *What I Have Done with Birds* (1907); *At the Foot of the Rainbow* (1908); *A Girl of the Limberlost* (1909); *Birds of the Bible* (1909); *Music of the Wild* (1910); *The Harvester* (1911); *Moths of the Limberlost* (1912); *Laddie* (1913); *Michael O'Halloran* (1915).

PORTER, Henry. An English dramatist who, alone or in collaboration with Ben Jonson, Chettle, or others, wrote plays for Philip Henslowe (q.v.) from 1596 to 1599. The only one extant is *The Pleasant Historie of the Two Angrie Women of Abington* (1599), which Lamb declared as good as *The Taming of the Shrew.* Edited by Havelock Ellis, it appeared in the volume *Nero and Other Plays*, in the "Mermaid Series" (1888), and, edited by C. M. Gayley, in *Early Comedies* (1903).

PORTER, Horace (1837–). An American soldier and diplomat. He was born at Huntingdon, Pa., studied for a year at the Lawrence Scientific School, Harvard, then entered West Point, where he graduated in 1860, and a year later was commissioned first lieutenant and detailed for duty as ordnance officer of the Port Royal Expeditionary Corps. At the reduction of Fort Pulaski, Ga. (April 10–11, 1862), he was the chief of ordnance and artillery, and by his gallantry earned the brevet rank of captain. In the attack on Secessionville, S. C. (June 16, 1862), he was wounded, but was able to act as chief of ordnance in the transfer of the Army of the Potomac from Harrison's Landing, Va., to Maryland, after the Peninsular campaign of 1862. He was then assigned to duty in the West, and participated in the Tennessee campaign (June 24–Nov. 1, 1863), during which he fought at the battle of Chickamauga and took part in the defense of Chattanooga. On April 4, 1864, he was promoted lieutenant colonel and was assigned to the staff of General Grant, with whom he remained until July 25, 1866, taking part in all the battles of the Richmond campaign until the surrender at Appomattox Courthouse. On March 13, 1865, he received the brevet rank of brigadier general in the regular army. After the war, when General Grant was for a few months in 1867 Secretary of War, Porter became his assistant, and when Grant was elected to the presidency Porter became his private secretary. In 1873 he resigned from the army to become vice president of the Pullman Car Company, and during the following years he filled executive positions on several railroads. In 1897–1905 he was Ambassador to France. During his ambassadorship General Porter interested himself in ascertaining the burial place of John Paul Jones, and finally found the body of the admiral in the old St. Louis churchyard in Paris on April 14, 1905. The body was conveyed to the United States by government war vessels, and was buried at Annapolis. General Porter's writings include: *West Point Life* (1866); *Campaigning with Grant* (1897); and the articles on "Five Forks and the Pursuit of Lee" and "The Surrender at Appomattox Court House," in *Battles and Leaders of the Civil War* (1887).

PORTER, James (1753–98). An Irish clergyman and author, the son of a poor farmer. He was born near Ballindrait in the County of Donegal. Leaving his father's farm, he taught school, and later studied for the Presbyterian ministry at Glasgow. In 1787 he was ordained minister at Greyabbey in the County of Down. For the Belfast *Northern Star*, a newspaper founded by Samuel Neilson in the interests of the Society of United Irishmen, Porter wrote several patriotic songs (1794), republished as *Paddy's Resource*, and the famous seven letters by "A Presbyterian," reprinted as *Billy Bluff and Squire Firebrand* (1796). These brilliant satires eventually cost Porter his life. On the outbreak of the rebellion in 1798 he was, without fair trial, convicted of treason and hanged.

PORTER, James (1808–88). An American Methodist Episcopal minister. He was born at Middleboro, Mass., and joined the New England conference in 1830. He was elected one of the agents of the Methodist Book Concern in 1856 and reëlected in 1860 and 1864; was secretary of the National Temperance Society in 1868–82; member of the board of overseers of Harvard University in 1852–55; trustee of Wesleyan University in 1855–71. He wrote a number of religious works.

PORTER, Jane (1776–1850). An English novelist, born in Durham. She was educated in Edinburgh, and lived with her mother and sister till their death at Esher in Surrey, where she passed her last years. In her childhood she was often visited by young Walter Scott, who delighted her with fairy tales and stories of the border. Her first work, *Thaddeus of Warsaw* (1803), was extremely popular and secured her a complimentary letter from Kosciuszko and election into the Teutonic Order of St. Joachim. In 1810 she published *Scottish Chiefs,* dealing with the times of Bruce and Wallace. This book was translated into German and Russian and won European fame. It is by far the best historical romance before Scott. She composed with her sister Anna Maria, *Tales Round a Winter Hearth* (1826) and *The Fields of Forty Footsteps* (1828). Her last novel, *Sir Edward Seaward's Diary* (1831), purporting to be founded on fact, created a great sensation.

PORTER, Jermain Gildersleeve (1852–). An American astronomer, born at Buffalo, N. Y. He graduated in 1873 from Hamilton College, to which, after a year at Berlin, he returned as assistant professor of astronomy (1875–78). Porter was a member of the United States Coast and Geodetic Survey from 1878 to 1884, when he became director of the Cincinnati Observatory and professor of astronomy in the city's university. In 1894 he received the *Astronomical Journal* comet prize. His publications include, besides numerous catalogues of stars: *Our Celestial Home* (1888); *Charts and Measures of Nebulæ* (1891); *Historical Sketch of Cincinnati Observatory* (1893); *The Stars in Song and Legend* (1901); *Variation of Latitude* (1908).

PORTER, Noah (1811–92). An American professor of philosophy and college president, born at Farmington, Conn. After graduating at Yale in 1831 he was for a short time rector of the Hopkins Grammar School and subsequently was a tutor in Yale College. He then entered the Congregational ministry, and was successively a pastor in New Milford, Conn. (1836), and in Springfield, Mass. (1843–46). In 1846 he became the first incumbent of the Clark professorship of metaphysics at Yale, a position he held until his death. In the winter of 1853–54 he studied in the University of Berlin. From 1871 to 1886 he was president of Yale. His principal publications are textbooks on *The Human Intellect* (1868) and on *The Elements of Moral Science* (1885). He was also the editor in chief of two quarto editions of Webster's Dictionary (1846, 1890). His minor works included: *Books and Reading* (1870); *Science of Nature vs. Science of Man* (1881); *Science and Sentiment* (1882); a commemoration of *Bishop Berkeley* (1885). After his death the tributes to his memory by some of his friends and colleagues were printed in a small volume.

One of the sisters of President Porter, Miss Sarah Porter (1813–1900), established and maintained in Farmington, Conn., a school for girls which acquired a wide reputation. A brother, Samuel Porter, spent his life as one of the professors in the Gallaudet College for Deaf Mutes in Washington, and wrote the guide to pronunciation for the edition of Webster's Dictionary of 1890.

PORTER, Peter Buel (1773–1844). An American political leader and soldier, born at Salisbury, Conn. He graduated at Yale in 1791, and after 1795 practiced law, first at Canandaigua, N. Y., and then at Black Rock, now part of the city of Buffalo. He was elected a Democratic member of Congress in 1808, and there became a conspicuous advocate of internal improvements. He was reëlected in 1810, and for a time was chairman of the Committee on Foreign Relations. As such he wrote the report in 1811 which advised hostilities with Great Britain. At the outbreak of the War of 1812 he resigned his seat in Congress and led a body of New York and Pennsylvania volunteers to the Niagara frontier, where he joined the forces under Gen. Alexander Smyth. Porter soon became disgusted with his superior's management of the expedition, and charged him with being a coward. This led to a bloodless duel on Grand Island. Afterward, when Gen. Jacob Brown (q.v.) led the Americans into Canada, Porter commanded one of three brigades into which the army was divided, and participated in the battles of Chippewa and Lundy's Lane and the siege of Fort Erie. In 1815 he again entered Congress, and served until the following year, when he was appointed one of the commissioners under the Treaty of Ghent to determine the northwestern boundary. In 1828 he became Secretary of War in John Quincy Adams's cabinet, and served until the end of the administration a year later. He was a member of the first Erie Canal Commission.

PORTER, Robert Percival (1852–). An American journalist, born at Norwich, England. He emigrated to the United States, and in 1872 was one of the original staff of the Chicago *Inter-Ocean,* devoting his attention chiefly to economic questions. He made reports for the tenth census, and in 1882 was appointed a member of the Tariff Commission. The New York *Tribune* and the Philadelphia *Press* sent him to Europe to study industrial conditions, and in 1887 he joined Frank Hatton in founding the New York *Press.* From 1890 to 1894 he was superintendent of the eleventh census. In 1904 he joined the staff of the London *Times.* Later he was commissioned to investigate economic conditions in Japan, Cuba, and Porto Rico. He published: *The West in 1880* (1882); *Breadwinners Abroad* (1885); *Free Trade Folly* (1886); *Commerce and Industry of Japan* (1896); *Life of William McKinley* (1896); *Industrial Cuba* (1899); *Lectures and Addresses on Municipal Ownership* (1903); *Dangers of Municipal Ownership* (1907); *The Full Recognition of Japan* (1911).

PORTER, Sydney William. See Henry, O.

PORTER, Thomas Conrad (1822–1901). An American botanist. He was born at Alexandria, Pa., graduated at Lafayette College in 1840 and at Princeton Theological Seminary in 1843, and preached for five years. In 1848 he was appointed to the chair of natural science in Marshall (later Franklin and Marshall) College, and in 1866 became professor of botany in Lafayette College. Porter retired from active duties in 1897, but remained curator of the botanical collections and dean of the Pardee Scientific School. He wrote several essays on Finnish literature and published: *Sketch of the Flora of Pennsylvania* (1872); *Sketch of the Botany of the United States* (1873); *Synoptical Flora of Colorado* (1874), with J. M. Coulter; *The Carices of Pennsylvania* (1887); *The Grasses of Pennsylvania* (1893).

PORTER, WILLIAM DAVID (1809–64). An American naval officer, son of Commodore David Porter and brother of Admiral David D. Porter, born at New Orleans, La. He entered the United States navy as a midshipman in 1823, rose to the rank of lieutenant in 1833, was placed on the reserved list in 1855, but in 1859 was restored to active service with the rank of commander. He saw service in the Mexican War, organized the United States lighthouse system, and after the outbreak of the Civil War commanded the ironclad *Essex* on the Mississippi. He took part in the capture of Forts Henry and Donelson, ran the gantlet of the Confederate batteries from Cairo to New Orleans, fought two engagements with the Confederate ram *Arkansas*, destroying her in the second (Aug. 6, 1862), and later in the same year shelled the batteries at Natchez, Vicksburg, and Port Hudson. He was promoted to the rank of commodore on July 16, 1862.

POR′TERSVILLE. A city in Tulare Co., Cal., 30 miles southeast of Visalia, on the Southern Pacific Railroad (Map: California, F 6). It is situated in a region producing citrus and deciduous fruit, olives, alfalfa, cattle, berries, etc., which it ships in large quantities, the annual shipment of citrus alone being about 5000 carloads for the district. There are also some lumber and mining interests, granite and marble works, canneries, creameries, and a cement-pipe plant. Portersville has a Carnegie library, high school, three parks, and a municipal water system. Pop., 1910, 2696.

PORTE SAINT-DENIS, pôrt săɴ′de-nē̇′. An arch on the Boulevard Saint-Denis in Paris, erected from designs by Blondel in 1672 to commemorate the victories of Louis XIV in Holland and on the lower Rhine, typified by a dead lion and a river god of the Rhine at the base of the arch. It is 81 feet in height, 82 in width, and 16 in thickness, with a single archway 50 feet high.

PORTE SAINT-MARTIN, săɴ′-mȧr′tăɴ′. A triumphal arch at the intersection of the Boulevard Saint-Martin with the Rue Saint-Martin, Paris, built in 1674 by P. Bullet in honor of Louis XIV. It is 57 feet in height and has three archways.

PORTFO′LIO, THE. A periodical edited in Philadelphia from 1801 to 1812 by Joseph Dennie. Among the contributors were Charles Brockden Brown and John Quincy Adams, whose *Letters from Silesia* appeared in it.

PORT GLASGOW, glăs′gō̇, *or* -kō̇. A seaport in Renfrewshire, Scotland, on the Clyde, 2 miles east of Greenock and 17 miles west-northwest of Glasgow (Map: Scotland, D 4). It was founded in 1668 by the magistrates of Glasgow as a harbor for the ships that belonged to or traded with their city, the Clyde at Glasgow being inconveniently shallow. Port Glasgow is a well-built town. The principal buildings are the townhouse and the customhouse. It has extensive manufactures of sail ropes and chain cables, and there are sugar refineries, foundries, ship-building yards, commodious quays, and an extensive wet dock. The municipal industries include the gas and water works, abattoirs, baths, and washhouses. A free library, an orphanage, and a cemetery are maintained. Pop., 1901, 16,840; 1911, 17,775.

PORT HOPE. A town, port of entry, and the capital of Durham County, Ontario, Canada, 60 miles east of Toronto, on Lake Ontario and on the Grand Trunk, Canadian Northern, and Canadian Pacific railroads (Map: Ontario, G 6). Situated in a beautiful valley on a fine harbor, the town is a popular summer resort, and has steamship connection with Rochester, N. Y., Toronto, and Montreal. The town is the seat of Trinity College School for boys, and has a public library, an opera house, and two parks. The industrial establishments include iron sewer pipe and connecting works, greenhouses, flour and planing mills, machine shops, preserving and canning works, tanneries, and manufactories of plumbers' supplies, leather, pottery, red brick, carriages, rubber, wooden and steel mats. Pop., 1901, 4188; 1911, 5092.

PORTHOS, pôr′tō̇s′. One of the three guardsmen in Dumas's "Three Musketeers" romances. He is gigantic in size, boastful, vain, and indiscreet, but lovable for the honest simplicity of his character.

PORT HUD′SON. A small village in Louisiana, on the eastern bank of the Mississippi River, about 135 miles above New Orleans, situated at the outward angle of an abrupt bend of the river. In 1862, during the Civil War, the Confederates constructed formidable batteries for a distance of 3 miles along the high bluffs around Port Hudson, and thus secured effectual control of the river at this point. In the spring of 1863 General Banks, with a large Federal force, proceeded against the position, and after trying ineffectually to turn it on the west, invested it on March 26, Admiral Farragut having previously, on the night of March 14–15, run by the batteries with two vessels of his fleet, the *Hartford* and the *Albatross*, and thus secured the control of the river both above and below Port Hudson. This control, however, was bought at the cost of one vessel, the *Mississippi*, destroyed, and four vessels, which had been forced to turn back, disabled. On March 27 Banks made a determined but unsuccessful assault, and on the following day began a regular siege. On June 14 another unsuccessful assault was made, and then the siege continued until early in July, when a third assault was planned. On July 7, however, news of the surrender of Vicksburg to General Grant was received, and on the following day General Gardner, in command of the Confederates, agreed upon terms of surrender, a Federal force taking possession on the 9th. The Federal attacking force numbered altogether about 20,000, though its effective strength never exceeded about 13,000. Of these 707 were killed, 3336 were wounded, and 319 were reported missing. The Confederate garrison numbered about 7500, of whom about 700 were killed or wounded, 500 were reported missing, and 6340 were surrendered. The capture of Vicksburg and Port Hudson secured to the Union the control of the Mississippi. Consult Johnson and Buel (eds.), *Battles and Leaders of the Civil War*, vol. iii (New York, 1887).

PORT HU′RON. A city and the county seat of St. Clair Co., Mich., 60 miles northeast of Detroit, on Lake Huron, at the head of the St. Clair River, and on the Pere Marquette and the Grand Trunk railroads (Map: Michigan, G 6). It has also steamboat connection with Detroit, Chicago, Duluth, and other lake and river ports. The city is built on both sides of the Black River, which here flows into the St. Clair. A railroad tunnel under the St. Clair River connects with Sarnia, Canada; it is more than a mile in length. Port Huron has acquired considerable reputation as a summer resort, owing to its mineral water and lake site, but is greater as a manufacturing, shipping, and commercial centre. There are a Carnegie library, a public hospital and home, and several public parks. The city has many notable edifices, including the Federal government building, city hall, United States customhouse, county courthouse, and two Maccabee temples, besides a number of business buildings.

Port Huron is a port of entry, and controls a large commerce with Canada. Its total foreign trade for the year ending June 30, 1915, consisted of exports valued at $36,855,761 and imports valued at $8,051,029. It has a large dry dock and shipyard. Among the many other industrial establishments are railroad shops of the Grand Trunk, foundries, boiler and engine works, farm-machinery works, and manufactories of brass goods and automobile engines. The city has adopted the commission form of government. A French fort was established here in 1686 by Duluth and maintained for two years. In 1814 Fort Gratiot was built on the same site by the United States and maintained until 1879. Port Huron was organized as a village under its present name in 1849, and was chartered as a city in 1857. Pop., 1900, 19,158; 1910, 18,863.

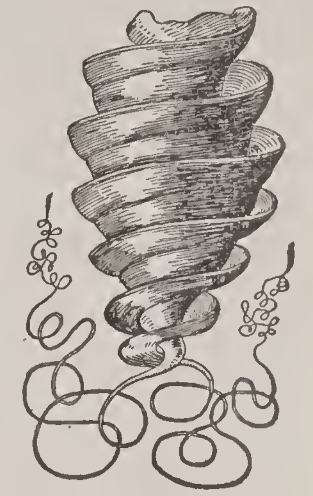
PORTIA, pôr′shĭ-ȧ. A rich heiress in Shakespeare's *Merchant of Venice*.

PORTICI, pôr′tē̇-chē̇. A town in the Province of Naples, Italy, situated on the Bay of Naples and on the slope of Vesuvius, 5 miles by rail southeast of Naples (Map: Italy, F 1). Its environs abound in fine villas. The castle built by Charles III in 1738 contains a school of agriculture. The town has a Gymnasium and a lyceum. The inhabitants are engaged in fisheries and in the weaving of silk. Portici has been several times destroyed by lava and rebuilt. Immediately adjoining the town are the ruins of Herculaneum. Pop. (commune), 1901, 14,538; 1911, 14,329.

POR′TICO (It. *portico*, from Lat. *porticus*, porch, gallery, from *porta*, gate). A covered space with a roof supported by one or more rows of columns and open on one or more sides. It is usually attached to an important building, but is sometimes detached as a shady walk. A portico is called tetrastyle, hexastyle, octostyle, and decastyle, according as it has 4, 6, 8, or 10 columns in front. The term is used to designate the space all around the cella of a Greek peripteral temple or of that in the front and rear of a temple *in antis*.

POR′TION (Lat. *portio*, share; connected with *pars*, part, *parare*, to prepare, Gk. ἔπορον, *eporon*, I prepared). A share of a parent's property or estate, or that of a person standing *in loco parentis*, which is devised or bequeathed by will, or descends to a child, or which is given to him by the parent during the lifetime of the latter and is intended to be a final provision for the child in case of the parent's death. The word "portion" has no special technical signification in the law to-day except where property is given to children by way of advancement, as a marriage portion, by which the parent anticipates the probable amount the child would receive in case of the parent's death. See ADVANCEMENT; DESCENT; INHERITANCE; WILL.

PORT JACKSON SHARK. One of the small cestraciont sharks of Australian and South Pacific seas, of which the principal species (*Cestracion philippi*) is common about the southern shores of Australia and takes its name from one of the harbors. The egg is very curious, consisting of a conoid leathery case, around which is wound spirally a broad flange, and two horny tendrils serve to attach it to some support. See CESTRACIONT; and Colored Plate of FISHES OF THE PHILIPPINES, accompanying article PHILIPPINE ISLANDS.



EGG CASE OF A CESTRACIONT SHARK.

PORT JER′VIS. A city in Orange Co., N. Y., 88 miles by rail northwest of New York City, on the Erie and the New York, Ontario, and Western railroads (Map: New York, A 1). It is picturesquely situated at the confluence of the Delaware and Navesink rivers and at the junction of the boundary lines of New York, New Jersey, and Pennsylvania. A popular summer resort, the city is of equal importance as the railway station for a considerable territory much frequented in summer and widely celebrated for beautiful scenery, many waterfalls contributing to its picturesqueness. Port Jervis has a large public library, St. Mary's Orphan Asylum, a public hospital, an Elks home, a fine Federal building, and a soldiers monument. Among the industrial plants are the Erie Railroad shops, foundries, silver-plating works, glass, stove, trousers, shoe, saw, glove, harness, underwear, and silk factories, etc. Pop., 1900, 9385; 1910, 9564; 1915 (State census), 9413.

PORT′LAND. A town in Middlesex Co., Conn., on the Connecticut River, opposite Middletown, and on the New York, New Haven, and Hartford Railroad (Map: Connecticut, E 3). The manufacture of governors for engines and the quarrying of brownstone are the chief industries. Pop., 1900, 3856; 1910, 3425.

PORTLAND. A city in La Salle Co., Ill. Pop., 1910, 3194.

PORTLAND. A city and the county seat of Jay Co., Ind., 49 miles south-southeast of Fort Wayne, on the Salamonie River and on the Lake Erie and Western, Grand Rapids and Indiana, the Muncie and Portland, and the Cincinnati, Bluffton, and Chicago railroads (Map: Indiana, H 4). It has a Carnegie library and handsome public buildings. The city is in an agricultural region which possesses a supply of natural gas. There are various manufactures, including automobile wheels, foundry and machine-shop products, creamery products, baseball bats, butter tubs and cases, spokes, handles, brick, flour, etc. Pop., 1900, 4798; 1910, 5130.

PORTLAND. The largest city and commercial metropolis of Maine, the county seat of Cumberland County, situated on Casco Bay, 108 miles north by east of Boston (Map: Maine, B 5). It is the terminus of the Maine Central, the Boston and Maine, and the Grand Trunk railroads, and of numerous coastwise steamship lines, notably those to Boston, New York, and St. John, New Brunswick. It is also the winter port of several transatlantic lines. The harbor, spacious, deep, and secure, is one of the finest on either coast. Portland is one of the strongest fortified ports in the United States, Its defenses, extensive and thoroughly modern, include Fort Preble (q.v.), Fort Williams on Portland Head, Fort Levett on Cushing's Island, Fort McKinley on Great Diamond Island, and Fort Lyon on Cow Island. Forts Scammel and Gorges, strongly built of granite, are out of date, and serve only to enhance the picturesqueness of the harbor.

Portland occupies a site of great natural beauty on an elevated peninsula extending into Casco Bay, which is dotted with wooded islands; many of these are popular summer resorts. The city itself is widely known as a resort, and offers easy access to numerous watering places and beaches, notably that of Old Orchard. Several suburban trolley lines afford ready transportation, while the street-railway service ranks with the best in the country. Steam lines belt the city proper, and a marginal road extends along the water front of the business section. Portland is more than 18 square miles in area. It is laid out with considerable regularity, and the fine shade trees lining its streets have given it the name of the Forest City. The public-park system of 113 acres includes Deering Oaks, Lincoln Park, Fort Allen and Fort Sumner Parks, Monument Square with a soldiers and sailors monument, and the Eastern and Western promenades. These promenades and the observatory on Munjoy Hill command magnificent views of the city and its waters and of the adjacent country, bounded by the White Mountains of New Hampshire 70 miles inland. On the south slope of Munjoy is the Eastern Cemetery, the burial place of persons historically prominent. The house in which the poet Longfellow was born and the Wadsworth Mansion in which he afterward lived are still standing. A bronze statue of the poet and also a statue of Thomas B. Reed are features of the city. Among the fine buildings are the city hall, of Maine granite, costing nearly $1,000,000 and housing a municipal organ, one of the largest in the country; the Federal and the county courthouses; the Masonic Building; the Fidelity office building; the Exposition Building; the home office building of the Union Mutual Life Insurance Company; the Sweat Memorial Art Building; the Public Library, containing over 70,000 volumes; the building of the Maine Historical Society; and several fine churches. Institutions worthy of mention are the Maine Medical School, connected with Bowdoin College at Brunswick; the Maine General Hospital; the Maine Eye and Ear Infirmary; the United States Marine Hospital; the Children's Hospital, a very finely equipped orthopedic institution; and State schools for the deaf and for the blind. The fine steel and concrete bridge, under construction in 1915, across the harbor to South Portland will cost nearly $1,000,000.

Portland has always been noted for its commercial interests. In Colonial days and until long afterward it had a large trade with the West Indies. Later it sent out hundreds of fishing vessels. It still does a considerable coastwise business, and imports much coal, sulphur, China clay, and pulp wood. Possessing two large elevators, it exports millions of bushels of grain and large quantities of other foodstuffs, as well as live stock, chiefly to Liverpool, London, and Glasgow. It is the greatest manufacturing centre in northern New England. Among its products are lumber and lumber manufactures, stoneware, structural iron, elevators, printers' machinery, gas and marine engines, boilers, stoves, wire screens, furniture, white lead and paints, canned goods, boots and shoes, hats, clothing, chewing gum, mineral and soda water, and laboratory products.

The government of the city is vested in a mayor, elected annually, a bicameral council, and the usual administrative officials. The school board, chosen by popular vote, elects the superintendent of schools.

Pop., 1800, 3822; 1850, 20,815; 1870, 31,413; 1890, 36,425; 1910, 58,571; 1915 (U. S. est.), 63,014.

Portland was settled by two Englishmen, George Cleves and Richard Tucker, in 1632, and until 1658, when its name was changed to Falmouth, was known as Casco Neck. In 1676 and again in 1690 it was completely destroyed by Indians, and all its inhabitants were massacred or captured. It was resettled in 1715, was bombarded and burned by a British fleet in 1775, was incorporated as a town under its present name in 1786, and was chartered as a city in 1832. On July 4, 1866, a fire consumed 1500 buildings, causing a loss of about $10,000,000. Longfellow, N. P. Willis, Commodore Preble, Neal Dow, and Thomas B. Reed were natives of Portland. Consult: William Willis, *History of Portland* (2d ed., Portland, 1865); Neal, *Portland* (ib., 1874); Goold, *Portland in the Past* (ib., 1886).

PORTLAND. The largest city in Oregon and the county seat of Multnomah County, an important commercial and industrial centre. It is situated on both sides of the Willamette River, at its confluence with the Columbia River, about 115 miles from the Pacific Ocean, 52 miles north-northeast of Salem, the State capital, and 774 miles north by east of San Francisco (Map: Oregon, C 2). It is built on slopes rising gradually from the river banks into wooded hills, with tall mountains in the distance—a site of great natural beauty. In the vicinity are numerous picturesque waterfalls; and Council Crest, in the western part of the city, commands a superb view of the distant mountains and the valleys of the Columbia and the Willamette.

The city has an area of 70 square miles, and is well laid out. There are a park system of more than 360 acres, a city zoo, and the finest sunken gardens in the United States. Among the noteworthy structures in Portland are the city hall, post office, courthouse, Portland library, high schools, and many large office buildings ranging from 10 to 15 stories high. The medical department of the State University is in Portland, and there are several well-known preparatory schools. The Portland Public Library contains 218,346 volumes. The city has a number of charitable institutions, of which St. Vincent's and Good Samaritan hospitals are the best known. Other features of interest are two handsome fountains, 25 bronze drinking fountains, historical statues in city parks, and five big steel bridges spanning the Willamette River. It is likewise the seat of Reed College, with a $2,000,000 endowment.

Portland has exceptional advantages for a commercial centre, having in its exclusive trade district 154,000 square miles. Situated at the head of ocean navigation on the waterway formed by the Columbia and the Willamette, it possesses a fresh-water harbor (the only large one on the Pacific coast) commodious and accessible for the largest ships. Its port is the terminus of several ocean and coastwise steamship lines; and in the large union station seven great railroad systems terminate—the Great Northern, Northern Pacific, Southern Pacific, Union Pacific, Chicago, Burlington, and Quincy, Canadian Pacific, Chicago, Milwaukee, and St. Paul.

The tributary region, rich in timber and in agricultural and mineral resources, is one of the most productive in the United States, though but partly developed. In 1914 the foreign commerce of the port was valued at $18,366,920, the exports, principally grain, flour, and lumber, constituting a very large proportion of this total. The foreign trade is carried on chiefly with Great Britain, its possessions, and the Orient. Portland is highly important also as a distributing point, its wholesale and jobbing trade in 1914 amounting to about $200,000,000. Its industrial interests are extensive and are growing fast, representing during the calendar year 1914 an invested capital of $30,000,000 and having a production valued at $47,000,000. The manufactures are favored by the power obtained from the Willamette Falls at Oregon City (q.v.), 12 miles distant. This power, electrically transmitted to Portland, is utilized also for lighting and for the operation of street railways.

The leading manufactures include lumber and timber products, flouring and gristmill products, and the output of slaughtering and meat-packing plants. There are also bag factories, creameries, clothing factories, establishments for the roasting and grinding of coffee and spices, foundries and machine shops, including stove foundries, ironworks, manufactories of sashes and blinds, furniture factories, paint works, saddlery and harness factories, ship and boat building yards, soap and candle works, fruit drying and canning establishments, and bottling houses. A large floating dry dock, constructed in 1903, accommodates the largest vessels.

The government is vested in five commissioners, one of whom is mayor, elected every four years, all other city officials being appointed by the commission, except the auditor. The school board, however, is chosen by popular vote. Portland spent in 1914 in maintenance and operation $1,736,295: for fire department, $553,914; for the police department, $398,254; for the care of streets, $574,621; including lighting, $200,000. The net debt of the city in 1914 was $16,169,100; the assessed valuation of property, $307,918,080.

Portland was founded in 1845 by F. W. Pettygrove and A. L. Lovejoy. It was named by the former in honor of Portland, Me., and was chartered as a city in 1851. It suffered severely from fire in 1872 and 1873, the loss in the latter year having been about $1,350,000. Portland has had an exceedingly rapid growth, as indicated by the following figures of population: 1850, 821; 1870, 8293; 1890, 46,385; 1910, 207,214; 1915 (U. S. est.), 272,833. Consult Joseph Gaston, *Portland, Oregon: Its History and Builders* (3 vols., Chicago, 1911).

PORTLAND, Dukes of. The English family of Cavendish-Bentinck has borne the title of Duke of Portland since 1716, when it was conferred by King William III upon Henry Bentinck (1682–1726), son and heir of William Bentinck (1649–1709), first Earl of Portland. Henry's grandson, William Henry, the third duke (1738–1809), son of William, the second (1709–62), was twice Prime Minister of England (1783, 1807–09). The fourth in the line was another William Henry (1768–1854), whose son, William John, the fifth duke (1800–79), built the famous underground ballroom, halls, and passages at Welbeck Abbey. Never married, he was eccentric and a recluse. His secluded habits gave rise to stories of his alleged double life, out of which grew the celebrated Druce Case. This involved a claim to the Portland title and estates by Mrs. Anna Maria Druce in behalf of her son, the grandson of Thomas Charles Druce, on the ground that the latter and the duke were one and the same person. A history of the case is given in Charles Archard, *Portland Peerage Romance* (2d ed., London, 1913). The fifth duke was succeeded by his cousin, William John Arthur (1857–). The owner of about 183,200 acres, with large holdings in London, he was one of the group against whom Lloyd-George (q.v.) directed his land-reform proposals in 1913. His heir, the Marquis of Titchfield, was born in 1893. See also Bentinck.

PORTLAND, Isle of. A rocky peninsula projecting into the English Channel from the shore of Dorsetshire, 17 miles west of St. Alban's Head (Map: England, D 6). Its island character has been lost by connection with the mainland by Chesil Bank, a wave-built ridge of loose shingle. It is famous for its stone, of which some of the finest buildings in London are built, among them St. Paul's Cathedral. It contains a number of historic castles, such as Portland Castle, built by Henry VIII in 1520; Pennsylvania Castle, erected by a grandson of William Penn; and Bow and Arrow Castle, supposed to have been built by William Rufus. The peninsula is strongly fortified, and there is a huge convict prison with accommodations for 1500 prisoners, built in 1848. The Portland Breakwater (see Breakwater) affords a safe harbor of refuge. Pop., 1901, 15,202; 1910, 17,011.

PORTLAND CANAL. A long and narrow fiord indenting the west coast of North America northeast of Queen Charlotte Islands (Map: British Columbia, B 2). It extends northeastward for about 80 miles inland, is very deep, and is inclosed by precipitous cliffs and by mountains from 3000 to 6000 feet high. It forms the extreme southern boundary of Alaska, which it separates from British Columbia.

PORTLAND CEMENT. See Cement.

PORTLAND VASE. A beautiful vase, about a foot high, of transparent dark-blue glass, coated with opaque white glass, which has been cut away so as to resemble a cameo (q.v.). The scenes on the vase have as yet found no satisfactory explanation; one theory is that they are connected with the story of Peleus and Thetis. It was discovered in a large marble sarcophagus, of the third century of our era, which was found at Rome about the middle of the seventeenth century, and had contained the ashes of the dead. Its style, however, shows that it belongs to an earlier period, probably the first century B.C. It was at first deposited in the Barberini Palace in Rome, but was purchased by Sir William Hamilton (1770) and finally by the Duchess of Portland. In 1810 the Duke of Portland lent it to the British Museum. In 1845 an insane visitor to the museum dashed it to pieces with a stone, but the fragments were so skillfully united that the damage is scarcely perceptible. It was copied by Wedgwood (q.v.) in his new style of pottery. Consult: Josiah Wedgwood, *The Portland Vase*, edited by Windus (London, 1845); Friedrichs and Wolters, *Die Gipsabgüsse antiker Bildwerke*, Nos. 2008, 2009 (Berlin, 1885); Furtwängler and Reichhold, *Die griechische Vasenmalerie* (Munich, 1900–04).

PORT LOUIS, lo͞o′is *or* lo͞o′ē. The capital and the principal port of the British colony of Mauritius, situated on an inlet on the northwest coast (Map: Africa, K 7). It is well built, with straight, though narrow, streets. Its most notable buildings and institutions are the Roman Catholic and Protestant cathedrals, a library, a theatre, an observatory, and a botanical garden. Its harbor is capacious, and is defended by forts. By far the larger part of the trade of Mauritius passes through Port Louis, and a railway line connects the city with the south and east parts of the island. The population is decreasing, and the Indian and Chinese elements are becoming prominent at the expense of the European, though the latter still include more than half of the inhabitants. Pop., 1901, 52,740; 1911, 50,060.

PORT MAHÓN, mȧ-hōn′, or simply MAHÓN (Sp. Puerto Mahón). The chief town of the island of Minorca and one of the principal seaports of Spain, situated at the head of a bay on the east coast of the island (Map: Spain, H 3). It is a pleasant town with straight and regular streets, and many of its houses are built in the English style, dating from the time of the occupation by the British. The most notable buildings are the consistorial palace, the civil and military hospital, the fine Coliseum Theatre, and a church containing a magnificent organ. The town has a high school, a public library, and a museum. There are manufactures of cotton textiles and leather goods, but the chief importance of the town is derived from its harbor, which is one of the best in the Mediterranean. It has a large anchoring space, and is provided with a long quay accessible for the largest ships. Its situation makes it a convenient port of call between France and Algiers; it is also an important naval station. Trade amounts to over $1,000,000 annually; its chief exports are live stock and agricultural products. Pop., 1900, 17,975; 1910, 17,542. Mahón is supposed to have been founded by the Carthaginian general Mago, and its Roman name was Portus Magonis. It was in the possession of the English during the greater part of the eighteenth century.

PORT NATAL, nȧ-täl′, or **DURBAN**. The only city of Natal and the fourth seaport in importance in British South Africa (Map: Africa, H 8). It is situated in about lat. 30° S., long. 31° E., at the head of the landlocked Bay of Natal, the south end of which is marked by the fortified bluff and its lighthouse. Port Natal has become known as a watering place, and has electric street railways and all modern sanitary conveniences, including public baths. The centre of the town is occupied by the public gardens; there are also botanical gardens, a museum, an art gallery, a public library, a theatre, two parks, and a race course. In 1910 a new group of municipal buildings was completed at a cost of more than $1,500,000. Water is brought from a river 15 miles distant. The climate, although exceedingly hot during one or two months, is the most healthful of all African towns. The harbor, greatly improved by extensive wharves and dredging, is well protected, and is sufficiently deep for vessels of 30-foot draft. The shipping of the port in 1911 amounted to 3,079,000 tons entered and 3,134,000 tons cleared. The total value of the commerce in 1912 (mostly imports) was $76,705,000. Besides having a good harbor, Port Natal derives much importance from its position as the terminus of two railway lines leading into the Orange Free State and Transvaal provinces. Pop., 1904, 69,903; 1911, 69,187 (white, 31,783). The city was founded by the Dutch in 1828, and received its name Durban from Sir James D'Urban, then Governor of Cape Colony. Consult Ingram, *Story of an African Seaport: History of the Port and Borough of Durban* (London, 1900).

PORT NOLLOTH, nŏl′oth. See NAMAQUALAND.

PORTO ALEGRE, pôr′tȯ ȧ-lā′gre. The capital of the State of Rio Grande do Sul, Brazil, situated a short distance from the north extremity of the Lagoa dos Patos (Map: Argentina, J 4). It is one of the cleanest and best-built cities of Brazil, and has straight streets and several large squares, in one of which, the Praça de Dom Pedro, stand the government building and the house of the Legislature. Other notable buildings are the cathedral, the theatre of Dom Pedro, and the customhouse. The city has a high school, a normal school, a theological seminary, and a school of engineering. It is the chief outlet for the products of the north part of the state, and is connected with the interior by railroad. Its trade, however, is endangered by the rapid sanding up of the Rio Grande, the outlet of the lagoon, and extensive engineering works will be necessary to make the harbor of the city accessible to large vessels. The export trade, which is chiefly with Germany, the United States, and Great Britain, amounted to $1,277,585 in 1912, the chief articles exported being beef, salt pork, lard, hides, and flour. In 1912 its imports were valued at $11,537,354. Near the city is a coal mine yielding over 16,000 tons annually. Pop. (est.), 1914, 110,000.

PORTO-ALEGRE, MANOEL DE ARAUJO. See ARAUJO PORTO-ALEGRE, MANOEL DE.

POR′TOBEL′LO. A popular watering place on the Firth of Forth, 3 miles east of Edinburgh, Scotland (Map: Scotland, E 4). Its manufacturing establishments comprise potteries and earthenware, bottle, brick, and paper works, etc., but it is noted chiefly as a favorite summer resort for sea bathing. It has a commodious town hall, a marine promenade, and a spacious amusement pavilion. Pop., 1901, 9200; 1911, 16,762.

PORTO D'ANZIO. See ANZIO.

PORTO EMPEDOCLE, pôr′tȯ ĕm-pā′dȯ-klȧ. A city on the south coast of Sicily, 6 miles by rail southwest of Girgenti (q.v.), of which it is the seaport. It was formerly called Molo di

Girgenti. The merchants of Girgenti have here great storehouses hewn in the rock for sulphur and for grain. The harbor is 26 feet deep, has a lighthouse, and is protected by a mole over a mile long. Pop. (commune), 1901, 11,529; 1911, 11,060.

PORT OF ENTRY. Any point that may be designated by the customs administration for the unloading of foreign goods and their release into domestic trade. Originally ports of entry were necessarily located on the frontiers, chiefly in seaports. With the development of shipment in bond it became possible for any city to receive the designation of port of entry.

PORTO FERRAJO, pôr′tō̇ fĕr-rä′yō̇. The chief town of the island of Elba (q.v.).

PORT OF SPAIN. The capital of the British West Indian island of Trinidad, situated on the west coast of the island (Map: West Indies, G 5). It is considered one of the finest towns in the West Indies. There are a college and a fine botanical garden. Within the latter stands the magnificent residence of the Governor, and there are many other handsome buildings in the suburbs. Its excellent harbor can accommodate vessels of the heaviest draft. The port is the principal place of shipment for the products of the Orinoco region. Pop., 1901, 54,100; 1911, 59,658.

PORTOLANI, pŏr′tō̇-lä′nē̇ (It., from *porto*, harbor). Ancient maps containing charts and sailing directions. See MAP; NAVIGATION.

PORTO MAGGIORE, pôr′tō̇ mȧd-jō′rā̇. A town in the Province of Ferrara, Italy, situated on an island in the lagoons of the Commachio, about 15 miles by rail southeast of Ferrara. The products are grain, beet root, and rope, and there is a trade in cattle and fish. Pop. (commune), 1901, 20,162; 1911, 21,223.

PORTO MAURIZIO, mou-rēt′sē̇-ō̇. The capital of the Province of Porto Maurizio, Italy, situated on a promontory projecting into the Ligurian Sea, 58 miles by rail southwest of Genoa (Map: Italy, B 3). It is a winter resort, has a fine church, a library, a theatre, a technical institute, and a school of navigation. There is a shipping trade in olive oil, agricultural produce, and fish. Pop. (commune), 1901, 7141; 1911, 7853.

PORTO NOVO, nō′vō̇. The capital of the French West African Colony of Dahomey, situated a short distance from the Gulf of Guinea and connected by a lagoon with the seaport of Kotonu (Map: Africa, E 4). It trades in palm oil and kernels, has an experimental farm, and has railroad connections with Pobé on the Lagos frontier, 50 miles distant. Porto Novo was the capital of the negro state of the same name, incorporated in 1893 with the Colony of Dahomey. Pop. (est.), 30,000.

PORTO NOVO (native, *Parangipetta*). A seaport town of Madras, British India, situated on the Coromandel Coast, 15 miles south of Cuddalore (Map: India, D 7). Both the Portuguese and the Dutch had a factory here in the seventeenth century. Porto Novo is celebrated for its iron foundry, which supplied much of the material for the Madras railways, but is famous chiefly for the battle fought here on July 1, 1781, when Sir Eyre Coote, retreating after his defeat at Chidambaram, was again attacked by Hyder Ali with an overwhelming force, and by adroit strategy routed his assailants with great loss. Pop., about 15,000.

PORTO RICAN EXPEDITION, MILITARY AND NAVAL SOCIETY OF THE. A patriotic society projected at Cāguas, Porto Rico, Oct. 11, 1898, and organized at Columbus, Ohio, June 5, 1900. It comprises: (1) active members, who as officers or enlisted men in any branch of the United States service with the Porto Rican expedition were on the island before or on Oct. 18, 1898, the date of the raising of the American flag over the capitol at San Juan; (2) associate members, who are soldiers or sailors of good reputation belonging to organizations or vessels that composed the expedition, but who were detained in the United States by sickness or disability or on detached service, as well as members of the Red Cross Society, volunteer nurses, etc., who served with the army in Porto Rico; and (3) honorary members. The membership is about 500.

PORTO-RICHE, pôr′tō̇′rēsh′, GEORGES DE (1849–). A French dramatist, born at Bordeaux. He was made an Officer of the Legion of Honor. His plays include: *Le vertige* (1873); *Un drame sous Philippe II* (1875); *Les deux fautes* (1879); *La chance de Françoise* (1889); *L'Infidèle* (1890); *Amoureuse* (1894); *Le passé* (1898). The four last named were published in 1899 in one volume entitled *Théâtre d'amour.* Later appeared *Les Malefilâtre* (1904) and *Le vieil homme* (1911).

PORTO RICO, pôr′tō̇ rē′kō̇ (Sp. *Puerto Rico*, rich port). An island of the West Indies, the most easterly of the Greater Antilles, the smallest among them, but the first in density of population. It lies between lat. 17° 50′ and 18° 32′ N., long. 60° 30′ and 67° 16′ W., is nearly 1200 miles from the equator, 1000 miles from Havana and Key West, 1500 from New York, and 3000 from Cadiz, Spain (Map: West Indies, F 3). It is roughly rectangular in shape, nearly three times as long as it is broad, the greater axis extending almost directly east and west. Length, about 100 miles; area, 3606 square miles, including the three small islands Mona, Vieques, and Culebra, or about three times that of Rhode Island. It contrasts sharply with the other Greater Antilles in appearance, for its mountains are lower and on the whole it presents a hilly and picturesque rather than a mountainous aspect. A number of islands lie off the coast, but only the three mentioned above are of importance.

Topography. The coast line is about 360 miles in length, with comparatively few important indentations. Around the whole periphery of the island are numerous fluvial valleys disposed at right angles to the coast. The coastal plains comprise about one-tenth of the area. There are a few headlands along the coasts, which, however, are usually low, especially on the south side. They also lack the fringing keys such as border Cuba.

Passing across the island from east to west, a little south of the middle, is a broken, irregular range of hills or low mountains which towards the eastern end trend to the northeast and culminate in the peak of El Yunque, 3700 feet high. Elsewhere the range is from 2000 to 3000 feet in altitude, with a few summits over 3000 feet and passes a little below 2000 feet. The range is known by various names in different parts of the island, Cordillera Central, Sierra de Cayey, and Sierra de Luquillo in the northeast. From this backbone of the island the land slopes north and south, its steep hilly surface deeply cut by streams. Towards the coast it becomes somewhat more nearly level until it spreads away to the edge of the sea in broad, level, alluvial, fertile plains.

Hydrography. The central range of mountains forms the water parting of the island, most of the streams rising on its slopes and flowing northward or southward. Those flowing north have the longer courses and gentler slopes, and some of them are navigable for several miles by small boats and flat boats. The southern streams are not useful for navigation, and nearly all the Porto Rican rivers have troublesome bars at their mouths. The principal rivers are the Loiza or Río Grande, Bayamon, Morovis, Plata, Cibuca, Manati, Arecibo, and Guajataca, which flow to the north coast; the Culebrinas, Blanco, Mayaguez, and Guanajibo, flowing to the west; the Portugés, Jacaguas, Coamo, and Guamani, to the south; and the Humacao, Naguabo, and Fajardo to the east. The rivers give great facilities for water and steam power and irrigation. One reason why Porto Rico is more healthful than the other Antilles is because the streams afford such excellent drainage that there is an almost total absence of stagnant water. There are 8 small lakes on the north, east, and south slopes of the island.

Climate. Though the island is in the tropics, it is also under the régime of the persistent northeast trade winds, which temper the heat. The topography causes local climatic differences and the natives even speak of the "rigors of winter" in the upper altitudes. The annual range of temperature is from 98° F. to 50° F., which is sometimes reported among the mountains. The mean annual temperature of the island is 76° F., that of the coastal towns being somewhat higher and of the interior somewhat lower. The daily range of temperature is 10° or 11° on the coast and from 20° to 25° at inland points. The climate would seldom be oppressive if it were not for the constant high humidity. Rain falls almost daily, the average annual precipitation being about 77 inches. Nearly two-thirds of the precipitation falls in the summer and autumn. The average on the north coast is 65 inches. The rainfall is heavier in the highlands, which arrest much of the precipitation, so that the south slope of the island is much drier, and in some regions irrigation is necessary for the cultivation of crops. The heaviest rainfall occurs in the Luquillo where the annual average exceeds 135 inches. Among the causes that interfere with agricultural prosperity are hurricanes. Between 1515 and 1899 eighteen very destructive hurricanes occurred. The especially disastrous hurricane which visited the island on Aug. 8, 1899, caused large loss of life and immense damage to crops, and 250,000 persons were compelled for some time to depend upon the government for food.

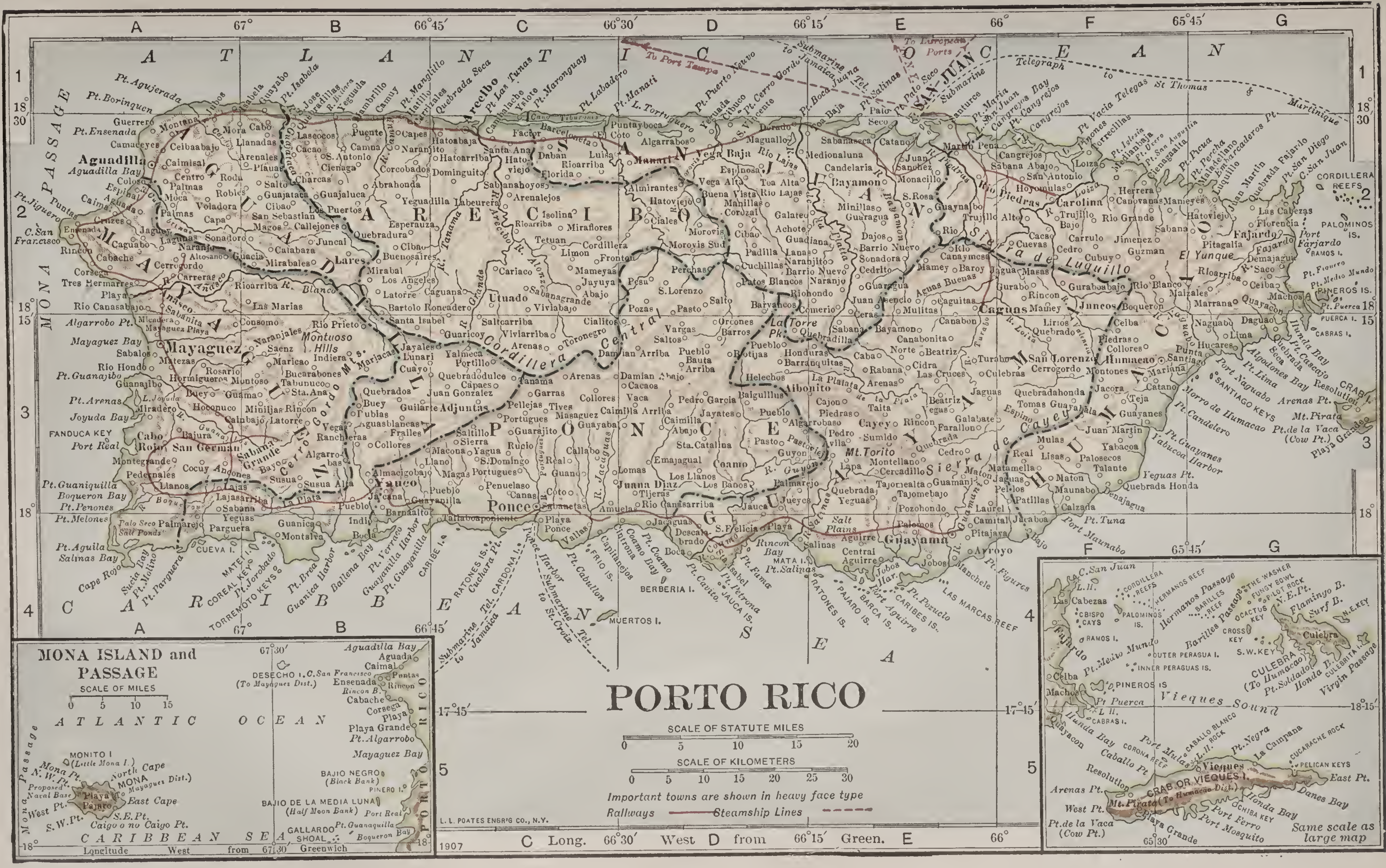
Near the ocean the soil is quite sandy; it becomes loamy as it extends inland, and gradually changes from a sandy to a clay loam on ascending the lower foot hills. The soil of most of the coastal plains is rich alluvium, which gradually merges into the clay loam of the hills. The ferruginous clay of the mountains is a source of abundant supply of plant food.

Flora. The island is famous for the number and size of its trees. The fine forests of the higher region resemble those of other islands of the West Indies, but are almost destitute of parasitic vegetation excepting orchids. The trees include several species of palms, a beautiful tillandsia, whose wood, called sabrino, is used for timber, a hard wood called ausubo, which is much used for the frames of buildings, hard and soft Spanish cedar and ebony, the West Indian sandalwood, the laurel, willow, and many woods useful for construction. About 30 medicinal plants are utilized, 12 plants for condiments, 12 for dyes and tanning, and 8 for resins, and many large trees produce edible fruits. The pastures are covered with nutritious grasses.

Fauna. The native fauna is very limited, there being no large mammals excepting those which are domesticated. There are no noxious reptiles and few insect pests. Flamingos and other water birds abound along the coast; and in the mountains are many birds, including doves. Fish of valuable species are abundant both in the fresh water and along the coasts. The gigantic tortoise is closely allied to the famous large tortoise of the Galapagos Islands.

Geology and Mineral Resources. The island has three geological elements: (1) a central system of deeply ribbed and corrugated mountains with V-shaped gorges and ridges; (2) lower hills along the north and south coasts; (3) coastal plains with alluvial soil extending from the foot of the central mountains across the line of foothills to the sea. The central mountains are formed of volcanic ejecta—tuffs and conglomerates—with occasional dikes and interbedded bluish limestone, which, however, is of rare occurrence. These mountain rocks, which are of Cretaceous and possibly early Eocene age, are entirely decayed at the surface, breaking down into a red clay resembling that of the southern Appalachians. The foothills are all of later Tertiary and Pleistocene age, and are composed entirely of rocks of sea origin, consisting of the peculiar type of tropical white limestones of a chalky, marly, and shelly nature. The island abounds in clay suitable for ordinary brick and earthenware. Good building sand is found, but little of it is sufficiently pure for glass making. The white limestones of the coastal plain supply excellent lime. The building stones are volcanic bowlders and limestone. Houses made of bowlders have a picturesque and rubbled appearance. Those constructed of limestone are always stuccoed, and the most elaborate buildings are made of limestone, including all of the public buildings and fortresses. Beautiful marble of great hardness is quarried near Juana Díaz, but as yet is used only for structural purposes, such as bridge piers. Sandstone is comparatively rare, but fine flagstone is abundant all over the island. Gypsum is used extensively for stucco, plaster, and fertilizer. A large area of the south coast abounds in phosphates, but the industry has developed only on Mona Island, off the west end of Porto Rico, where large amounts of guano and phosphates are found in the caves already explored. Near Ponce and elsewhere numerous caves are filled with rich deposits of guano, which are now being worked. Lignite is found, but the fuel resources have not yet been investigated. Sufficient salt for the needs of the island may easily be obtained from many lagoons near the sea by natural evaporation of the brine. The principal deposits are the salines of Coamo, Guanica, and Sierra de Piñones de Cabo Rojo. Invalids resort to a number of mineral springs, chiefly at Ponce and Coamo.

No mining of metals is yet carried on. Those most frequently found are gold, carbonate and


PORTO RICO
SCALE OF STATUTE MILES
0 5 10 15 20
SCALE OF KILOMETERS
0 5 10 15 20 25 30
Important towns are shown in heavy face type
Railways
Steamship Lines
Long. 66°30′ West from 66°15′ Green.
L. L. POATES ENGR'G CO., N.Y.
1907
ATLANTIC OCEAN
CARIBBEAN SEA
MONA PASSAGE
AGUADILLA
ARECIBO
BAYAMON
HUMACAO
GUAYAMA
PONCE
MAYAGUEZ
SAN JUAN
Cordillera Central
Sierra de Luquillo
Sierra de Cayey
El Yunque
Telegraph to St Thomas & Martinique
To Port Tampa
To European Ports
Submarine Tel. to Jamaica
Submarine Tel. to St. Croix
MONA ISLAND and PASSAGE
SCALE OF MILES
0 5 10 15
Longitude West from 67°30′ Greenwich
CULEBRA (To Humacao Dist.)
CRAB OR VIEQUES I. (To Humacao Dist.)
Vieques Sound
Same scale as large map

sulphide of copper, and magnetic oxide of iron. Varying quantities of gold were taken from the alluvium deposits, during the early part of the Spanish occupation and since the discovery of the island gold has been washed in small quantities from many rivers, especially in the north and east. It is suspected that gold-bearing lodes of quartz or conglomerate exist among the hills whence these streams issue. Experience has shown that the placer deposits are not rich or extensive. At one place north of Juncos there is a large deposit of magnetic iron ore.

The exact extent of the mineral resources is yet to be determined. No systematic survey of the entire island has yet been made, though small stretches here and there have been explored at various times. These have uncovered deposits of agate, mercury, molybdenite, and other minerals, but in too small quantities to warrant commercial exploration.

Agriculture. Agriculture has been the chief industry of Porto Rico almost since its discovery by Columbus. Sugar cane has been grown for 300 years. The forests have long since been cleared away, and practically every acre of land fit for cultivation has been utilized for at least 200 years.

In 1910, out of a total area of 2,198,400 acres, 2,085,162 acres were in farms, of an average size of 35.7 acres. The improved lands in farms amounted to 1,570,304 acres. The value of farm property in 1910, including land, buildings, implements and machinery, domestic animals, poultry, and bees, was $102,378,874. The average value of farm land per acre was $35.47. The total number of farms was 58,371. The three leading agricultural products are sugar, coffee, and tobacco. In 1909 there were 145,433 acres of sugar cane harvested. In the same year there were 186,875 acres devoted to growing coffee and 22,142 to tobacco (see also paragraphs *Manufactures* and *Commerce,* below). The growing of fruit and nuts ranks third among agricultural industries. The total value of these fruits in 1909 was $2,515,542. The most important are bananas, pineapples, plantains, oranges, and coconuts. The cereals are not grown to any extent. Beans form one of the most important vegetable crops. They are used not only as a food, but the plants are used as fertilizer for the soil. The growing of vegetables commonly found in more temperate climates has been rather unsuccessfully attempted. The climate seems to have a deteriorating effect upon good strains of vegetables brought from outside, and most of the vegetables sold in the market are of a tropical nature. It has been found that sea-island cotton can be grown on the island, but little effort has been made to further its cultivation.

Live Stock and Dairy Products. The total value of domestic animals in 1910 was $10,935,263. The cattle numbered 315,745 and were valued at $8,354,677; of these the dairy cows numbered 62,890, of $2,091,651 value. There were in the same year 58,201 horses, valued at $1,877,828; 4784 mules, valued at $342,799; 106,092 swine, valued at $257,645, and 49,079 goats, valued at $73,987. The total value of milk sold and cheese made in that year was reported at $722,148.

Manufactures. The manufactures of Porto Rico are directly dependent upon agriculture. The most important industries are the manufacturing of sugar and molasses, the making of cigars and cigarettes, and the cleaning and polishing of coffee. The first census of manufactures was taken in 1909, the most important figures of which are shown in the table below.

SUMMARY OF INDUSTRIES FOR 1909

INDUSTRY	Number of establishments	Wage earners (average)	Value of products	Value added by manufacture
All industries	939	15,582	$36,750,000	$15,271,000
Sugar and molasses	108	5,062	20,569,000	8,295,000
Tobacco manufactures	282	7,025	6,060,000	4,002,000
Coffee, cleaning and polishing	37	120	5,053,000	289,000
Bread and other bakery products	258	1,197	1,730,000	557,000
Liquors, distilled	14	58	1,117,000	974,000
Printing and publishing	43	353	371,000	235,000
Lumber and timber products	8	123	269,000	91,000
Boot and shoe shops	59	303	190,000	92,000
Cars and general shop construction and repairs by steam-railroad companies	6	342	186,000	125,000
Foundry and machine-shop products	6	188	178,000	120,000
Hats, straw	3	122	177,000	91,000
Leather, tanned, curried, and finished	4	46	176,000	85,000
All other industries	111	643	674,000	315,000

The value of the products of the sugar and molasses industry in 1909 formed 56 per cent of the total production of the island. The raw sugar produced amounted to 566,445,203 pounds and molasses to 17,874,097 gallons. The total value of the raw sugar was $20,164,187 and of the molasses $379,008. The tobacco industry is confined chiefly to the manufacture of cigars and cigarettes. In 1909 a total of 217,792,000 cigars were manufactured, of which 152,739,000 were for export. Third among the industries is the cleaning and polishing of coffee. In 1909, 65,225,378 pounds of rough coffee were treated. The modern wet process is superseding the old and dry method, which required a larger investment than the small planter can afford. As a result of changes in the method of preparing, the coffee market is being transferred from the plants to the large custom mills. See paragraph *Agriculture* above. Of the total number of wage earners 13,928 were males, 1654 females, of whom 758 were under 16 years of age.

The industries are not developed to any extent in the cities, as the population of the island is overwhelmingly rural. In San Juan and Ponce, the only cities of a population of over 25,000, the tobacco manufactories constitute the chief industry. Coffee cleaning and polishing is the chief industry of Mayaguez and Caguas, cities of over 10,000 inhabitants.

Commerce. The commerce has greatly increased under conditions which followed the American occupation. The United States is the chief customer both in import and export trade. In the fiscal year 1915 the shipments of merchandise from the United States to Porto Rico amounted to $30,149,764, an increase of more than 100 per cent since 1905. The imports from foreign countries were $2,954,000. The shipments of domestic merchandise from the island to continental United States were valued at $41,950,419, representing an increase of 275 per cent for the same period, and the exports to foreign countries were $7,010,118. The principal imports from foreign countries were from Spain $679,413, Canada $506,328, England $253,278. The chief exports to foreign countries were to Cuba $2,786,944, Spain $187,806, France $815,282. The following table shows the chief articles of export to and import from the United States, with their values in 1915:

IMPORTS FROM AND EXPORTS TO CONTINENTAL UNITED STATES

(Year ending June 30, 1915)

IMPORTS	Value	Exports	Value
Cotton, manufactures of	$4,557,807	Coffee	$543,679
Iron and steel, and manufactures of	1,610,287	Fruits and nuts	3,434,707
Meat and dairy products	3,650,366	Sugar, unrefined	27,277,839
Wood, and manufactures of	1,036,307	Tobacco, manufactures of	6,026,721
Mineral oils	663,522		
Paper, manufactures of	593,687		

Transportation and Communications. With no point more than 18 miles from the sea, the only transportation problem is caused by the mountainous character of the interior. Up to the time of the American occupation in 1898 the Spaniards had constructed 170 miles of excellent highways, of which the principal one is the Military Road. This runs across from San Juan to Ponce. Since then about 1000 miles of macadamized roads have been built, extending to all parts of the island.

The railway lines are confined to the coastal plains. A steam railway operates along the northern coast from Carolina by way of San Juan to the west end of the island, and south by way of Mayaguez and Ponce to Guayama, thus making a circuit of about four-fifths of the island. This is supplemented by many short branches which connect it with the sugar centrals and other centres of industry. The main railways embrace those of the American Railway Company of Porto Rico, the Central Fortena Lines, and the lines of the Ponce and Guayama railway company, aggregating in all about 450 kilometers. The other railway lines are chiefly local, and have only short trackage.

Ocean transportation facilities are of even more importance to Porto Rico than land transportation. There are passenger and freight lines to New York, Spain, France, Germany, and Italy. The postal service and railway mail service are maintained by the Post Office Department of the United States. There are a modern telegraph service and telephone lines between the principal towns. Porto Rico has been in cable connection with the rest of the world for many years.

Banking. There were, in 1914, 15 banks and branches of banking institutions. These had a capital stock of $2,236,984, deposits of $11,017,045, surplus and profits of $1,000,910. The largest banks are the American Colonial Bank of Porto Rico, the Banco Comercial de Puerto Rico, and the Banco Territorial y Agrícola.

Government. The jurisdiction of the government of Porto Rico embraces the island of that name and adjacent islands lying east of the seventy-fourth meridian, ceded to the United States by Spain. The existing system of government is contained in the Organic Act of 1900, generally known as the Foraker Act. This was designed as a provisional law to enable a form of government to be maintained until Congress should have provided a permanent constitution. This Act provides among other things that the inhabitants of Porto Rico, who were Spanish subjects on Sept. 11, 1899, with the exception of such persons as wished to hold their allegiance to Spain, constitute a body known as the People of Porto Rico, which includes also the citizens of the United States resident in Porto Rico.

This Act has been amended by joint resolution of Congress, the most important of which is the Olmsted Act, which was passed on July 15, 1909. This Act made provision for the allotment of funds to keep up the government in the event of the failure of the local Legislature to enact the necessary budgets, and for the centralization of matters pertaining to the government of Porto Rico in one department in Washington. All reports are now made by the government or members of the Executive Council to the War Department, in which was established the Bureau of Insular Affairs.

Legislative.—The legislative power is vested in the Legislative Assembly, consisting of the Executive Council and the House of Delegates, corresponding respectively to the Senate and the House of Representatives. The Executive Council consists of 11 members appointed by the President for a term of four years. At least five of these must be native inhabitants of Porto Rico. One of these five and the other six are also the heads of the seven executive departments. The members of the House of Delegates are elected biennially, five from each of the seven electoral districts. Both houses of the Assembly convene annually on the second Monday in June of each year and remain in session for 60 days. The Legislature has the power to enact laws not in conflict with the Organic Act on all matters except the granting of franchises, privileges, and concessions, which power is vested in the Executive Council alone.

Executive.—The Governor is appointed by the President and holds office for a term of four years. He in turn appoints all judges and prosecuting attorneys of the district courts, justices of the peace, and other insular officers. The insular police force is also under his control and supervision. Other executive officers are Secretary, Treasurer, Auditor General, Commissioner of the Interior, Commissioner of Education, and the head of the Department of Health, Charities, and Corrections. All these are appointed by the Governor.

Judiciary.—The Department of Justice embraces the office of Attorney-General, the supreme, district, and municipal courts, justices of the peace, registrars of property and notaries. The Supreme Court is composed of five judges appointed by the President. Writs of error and appeals from the final decisions of this court in certain cases may be taken to the Supreme Court of the United States. The judges of the district courts are appointed by the Governor for a term of four years. Each district has a fiscal or prosecuting attorney. The municipal courts have jurisdiction in all criminal cases in which the offense charged is less than felony. The judges of these courts are elected by popular vote, each for a term of four years. Although the code of laws under which Porto Rico was governed under the old régime has been largely superseded, the Spanish law relating to inheritance, civil status, contracts in obligation, land titles and liens, the law of water, mines and commerce rules still remain in force.

Suffrage and Elections.—The Legislature has the power to determine the franchise, and that right has been conferred upon practically all adult males.

Local and Municipal Government.—There are about 70 municipalities in Porto Rico. The principal town in each district is the administrative centre. The people elect the chief officers, who appoint subordinates. Each municipal government has at its head a mayor or alcalde. He is the chief executive officer and the representative of the community before the courts and insular government. The local legislative power is conferred by a body known as the municipal council, composed of from nine to five members. The mayor and the members of the municipal council are elected for a term of four years.

Miscellaneous Provisions.—There are laws regulating the operation of public-service corporations, and the Executive Council has the practical power of a public-service commission. There are an employers' liability law and laws regulating the employment of women and children.

Finance. The revenues of the government are derived from customs, various forms of taxation, and miscellaneous sources. The total income of the government from all sources in the fiscal year 1913–14 was $7,714,973. The largest amount, $2,843,561, was derived from the excise tax. The total expenditures for the same year amounted to $7,278,328. The largest expenditure was for the Department of Education, $1,742,754. In addition to the regular revenues there is an income from trust funds derived from revenues in the United States on importations from Porto Rico. These are placed at the disposal of the President, to be used for the government and benefit of Porto Rico, for the aid and relief of the people, and for education and other public benefits. The total receipts from these funds in 1914 were $4,928,616, the expenditures were $3,774,621, and a balance in the treasury from the insular revenues of $284,273 and from the trust funds $1,154,065.

Population. The population of the island at different periods has been as follows: 1800, 155,426; 1860, 583,308; 1900, 953,243; 1910, 1,118,012. The average number of persons to the square mile in 1910 was 325.5. This was more than 10 times as great as in the United States proper. The urban population was 224,620, and the rural 893,392. The population was divided by color in 1910 as follows: white, 732,555; black, 50,245; mulatto, 335,192. The total native-born was 1,106,246 and the foreign-born 11,766. There were 557,301 males and 560,711 females. There are 2 cities (San Juan and Ponce), 64 towns, and 12 villages. The population of San Juan was, in 1910, 48,716, and of Ponce 35,005. Larger towns with populations in 1910 were: Mayaguez, 16,563; Caguas, 10,354; Arecibo, 9612; Guayama, 8321.

Health and Sanitation. Problems connected with health and sanitation have been among the most difficult with which the American authorities have had to contend. What success has accompanied these efforts is shown by the fact that the death rate has decreased from 40.81 per thousand in 1900 to 18.6 per thousand in 1913. The continued lowering of the death rate has resulted almost entirely from the service of sanitation, organized in 1912. An aggressive campaign has been started for the building in the various cities and towns of modern aqueducts for a supply of pure water, sewer systems, sanitary slaughterhouses and meat markets, and clean dairies. Attention has also been given to the work and personnel of the municipal physicians, from whom the poor receive all the medical attention that is within their reach. Twenty-six towns and cities now possess water works.

About 6 per cent of the yearly deaths are from tuberculosis, but 38 per cent of all deaths from preventable diseases are caused by this. Uncinariasis, or hookworm, has for many years been prevalent throughout the island. The first work for its eradication was done there by Dr. Bailey K. Ashford, and the report prepared by the Anæmia Commission, organized and maintained at the expense of the people, is accepted as an authority on this disease. In 1914, 69,004 cases of hookworm were treated. Several stations have been established at different points for giving treatments. Of the persons under treatment 81.6 per cent were white and 18.4 per cent colored. Leprosy is found, for the treatment of which an asylum is maintained. Other diseases found are typhoid fever, malaria, trachoma, and infantile tetanus. There were, in 1913–14, 27,405 deaths. Institutes of tropical medicine and hygiene, reorganized and made independent by the Legislature of 1913, have done most efficient service in the study of the diseases mentioned above.

Education. From the first years of the American occupation the authorities have directed the most vigorous efforts towards improving educational conditions. These efforts have been eminently successful, and great improvement in conditions has resulted. At the time of the American occupation there were only 528 schools in the island, with an enrollment of about 22,000 children. There was not one building specially constructed for school purposes, and schools were free only for poor children. In 1913–14 the total enrollment in all public schools was 207,010, out of a school population (ages 5 to 18 years) of 414,000. The average daily enrollment in all schools in the same year was 169,719, and the average daily attendance was 155,830, or 92 per cent. There were in operation an average of 4330 schools; in charge were 2564 teachers.

The school system is in the general charge of the Commissioner of Education. The 70 municipalities of the island are divided into 41 school districts, each under the direction of a supervising principal, who is appointed by the Commissioner of Education as his personal representative. The administration of the schools from a material point of view in each municipality is intrusted to a local school board, composed of three members, elected every four years by popular vote. In addition to the supervising principals there are three general superintendents and supervisors of athletics, agriculture, manual training, household economics, drawing, music, and writing.

The rural schools are the foundation of the school system of Porto Rico. Schools of this class are found in the most remote and mountainous districts of the island. Of the total population (1914), 1,235,000, approximately 79 per cent live in the rural districts, and over 70 per cent of these are illiterates. It has been found that the most effective means of eliminating this overwhelming majority of adult illiterates is the establishing of night schools. In 1914 there were approximately 351,000 children of school age living in rural districts; of these 109,524 were enrolled at some time during the school year. The average daily enrollment was 91,260. The average number of rural teachers during that year was 1335, all of whom were Porto Ricans. The salary of rural teachers is fixed by law at $45 and $50 for 20 days per month, depending upon the length of service.

There are graded schools within the urban limits of all towns and cities as well as in the villages and barrios of the island. These schools are taught by English graded teachers, all of whom are authorized to give instruction in all branches of the curriculum, using English as a medium, by principal teachers, and teachers in English. All English graded and principal teachers are Porto Ricans, whereas the teachers of English with few exceptions are Americans. The salaries of teachers in these schools vary from $65 to $90 per month. The course of study covers the eight grades of the elementary course.

Continuation schools are maintained in 25 of the larger towns of population for the purpose of taking pupils from the completion of the eighth grade and carrying them two years further in their educational curriculum without the necessity of leaving home.

Complete high schools in the four courses are established at San Juan, Ponce, Mayaguez, Arecibo, and Humaco. In addition to the regular high-school course they also have facilities for commercial courses and work in manual training and household economics. The total number of scholars enrolled in the secondary schools was 2288. The salary schedule for the high-school teachers varies from $810 to $1440 per year. Some practical instruction in agriculture and manual training is obligatory for all students taking work in the advanced schools.

All revenues for the support of the public-school system are from appropriations from the insular government and by appropriations from the local government. The local authorities are required to set the rate of 25 per cent of the local funds received from taxation for school purposes. In 1914, $2,993,417 were available for school purposes. The only institution of collegiate rank is the University of Porto Rico (q.v.).

Charities and Corrections. The charitable and correctional institutions include an insane asylum, an asylum for the blind, girls' charitable school, boys' charity school, the penitentiary, and a reform school. The total number of prisoners in the penal institutions was, in June, 1914, 11,243. Convict labor is employed upon the roads.

History. The island of Porto Rico has from the beginning played a secondary part in the history of the West Indies. It was discovered by Columbus on his second voyage in 1493 and was named San Juan Bautista by him. In 1508 Juan Ponce de León crossed the Mona channel from Hispaniola to investigate the reports of a rich and fruitful land in the island of San Juan. He was hospitably entertained by the native chief Agueynada, whose power seems to have extended over most of the island. Two years later, having secured authority to conquer and govern the island, Ponce de León returned thither with a large military force. He followed the north coast till he discovered the spacious bay on which he established his headquarters, founding a city which he named San Juan Bautista de Puerto Rico, whence comes the modern name for the whole island. Juan Ponce devoted himself for 10 years, except during his first expedition to Florida, to the pacification of the island and the extirpation of the hostile Caribs from the islands towards the southeast. After his death in 1521, successive Spanish administrators continued to rule the island, which had a peaceful, uneventful history for nearly 200 years. Under the repartimiento system, by which the Indians were forced to work on the Spanish plantations, the natives gradually decreased in numbers, and the consequent dearth of laborers resulted in the abandonment of many of the outlying estates. The Caribs in turn reëntered the island and occupied largely the eastern portions, so that for many years the Spaniards appear to have been restricted to the districts immediately dependent upon San Juan, Ponce, and one or two other towns. The corsairs and West Indian pirates also visited the island, using various places on the coast for more or less temporary headquarters. In 1595 Drake, after trying to induce the inhabitants to ransom the town with money which they did not possess, sacked San Juan, and three years later it again suffered similarly from the Duke of Cumberland. Heinrich, a Dutch sea captain, undertook to do the same thing in 1615, but was beaten off, losing his life in the assault. About the middle of the eighteenth century negro slaves and colonists from Spain began to be introduced in considerable numbers, and by 1780 the population had risen to nearly 80,000. In 1797 San Juan successfully withstood a three days' attack from the English Lord Abercrombie. During the first quarter of the nineteenth century the island became a popular resort for large numbers of those who desired to escape from the turmoil and disaster incident to the revolutionary movements in South America. As a result the population came to have a large preponderance of whites over the black and colored elements. Another consequence was the marked aversion of the populace to strife of any sort. An attempted rising against Spain in 1820 made headway for two or three years, but had no strong popular support. In 1867 another revolt was attempted by those who were engaged in the plots to free Cuba, but this was speedily suppressed. In 1869 Porto Rico was created a province of Spain, with representation in the Spanish Cortes by delegates elected by popular vote under the same suffrage as in Spain. The Governor-General was made the resident representative of the crown, and in practice all administrative power was in his hands. In 1873 the Spanish Cortes passed an Act for the abolition of slavery in Porto Rico. During the Spanish-American War the fortifications of San Juan were bombarded by a fleet under Admiral Sampson. On July 25, 1898, an expedition under General Miles landed on the island. Ponce surrendered on the 28th, and the American forces met with no effectual resistance until hostilities were terminated by the peace protocol of August 12. On October 18 the United States flag was raised over San Juan. By the Treaty of Paris, signed Dec. 10, 1898, Porto Rico was ceded to the United States. Following the establishment of a civil government in 1900, elections were held for the choice of a commissioner to Washington and members to the House of Delegates of the Porto Rican Legislature.

Much of the history of Porto Rico during the American régime has consisted of the orderly succession of the American governors and the varied legislation for improving the conditions of the country. One of the problems resulting from the transfer of the sovereignty in Porto Rico from Spain to the United States was the question of the Church lands. The Roman Catholic church brought suit against Porto Rico to recover certain lands, and in 1906 decisions were rendered in favor of the island in two cases and in favor of the Church in one. This question was finally adjusted by a commission of six members, appointed by the United States, Porto Rico, and the Church. The elections in 1908 were hotly contested by the Unionist party, which favored independence and self-government for the island, and the Republicans, whose platform was similar to that of the party of the same name in the United States. The elections resulted in a Unionist victory, and the following year the Insular House adopted a policy of refusing to pass the appropriation bills, in order to call attention to the opposition to the Organic Act and to endeavor to secure modifications of it. The United States Congress passed a measure reënacting the budget of the preceding year, and in turn the Insular House passed various measures obnoxious to the Governor and the Executive Council. Since this date there has been more or less of agitation in favor of greater independence in the insular government and the United States has considered steps looking towards a modification of the existing régime. In 1912 laws were passed providing for sanitary reform, a bureau of labor, and minority representation. The following year important labor legislation was enacted.

The list of American governors of Porto Rico is as follows:

Charles H. Allen	1900–1901
William H. Hunt	1901–1904
Beekman Winthrop	1904–1907
Regis H. Post	1907–1909
George R. Colton	1909–1913
Arthur Yager	1913–

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PORTO RICO, University of. An institution for higher education at Río Piedras, Porto Rico. It was first established as a normal school at Fajardo. It became evident that a more central location was necessary, and in 1909 the school was transferred to Río Piedras. The University of Porto Rico was created by an Act of the Legislature, March 12, 1913, and the normal school, with its land and property placed under the control of the university board of trustees, became the first department of the university. In 1913 colleges of law and pharmacy and the university high school were created. In the same year the course of the college of liberal arts was extended to cover four years, with the degree of B.S. or B.A., on satisfactory completion of the course. In addition to the department already mentioned there was a college of agriculture and mechanical arts. The material equipment of the university consists of about 200 acres of land, more than 100 of which are at Río Piedras and the remainder at Mayaguez. The campus in the former place contains nine structures used by the colleges of liberal arts and agriculture, and by the normal department. The university represents the logical point of academic contact between the Spanish and the English-speaking people of the Western Hemisphere. Its curriculum offers more extended courses in the Spanish language and literature than does any institution in the United States, and more extended courses in English than are to be found in either Spain or America. The enrollment in the normal department is more than 300, and in the college of liberal arts it is about 200. The normal department holds a summer session, which is attended by about 100 students. The university is supported by appropriations and by the insular government. Its total assets amount to about $400,000. The president in 1915 was E. M. Bainter, B.S.

PORTO SANTO, sän′tō̇. One of the Madeira Islands (q.v.).

PORTO TORRES, tôr′rȧs. A seaport in Sardinia. See SASSARI.

PORTOVIEJO, pôr′tō̇-vyā′ʜō̇. The capital town of the Province of Manabí, Ecuador, 98 miles north of Guayaquil (Map: Ecuador, A 4). It is an old town with narrow streets. The principal buildings are the cathedral, the governor's house, and the bishop's palace. Its high school is one of the best in the Republic. Cacao, coffee, sugar cane, and togua are produced in the vicinity. Its chief industry is the manufacture of straw hats. Pop. (est.), 8000. The town was founded in 1534.

PORT PHIL′LIP. The harbor of Melbourne (q.v.), Australia (Map: Victoria, D 6).

POR′TRAITURE. In the fine arts, the representation, by means of painting, sculpture, or engraving, of the appearance of an individual or a group of persons. As regards size, portraits may be busts, half figure, three-quarter, or full length; as regards the position of the countenance, they are full face, half profile, profile, or *profil perdu*, if the face is further reversed. Portraiture is of very ancient origin. Sepulchral statues of the earliest Egyptian kingdom show that the art was even then highly developed. During the best period of Greek art ideal portraits of individuals, of a certain likeness, but rather intended to represent character types, were frequently executed, both in statues and in busts, as may be seen from the most celebrated surviving examples, the Lateran "Sophocles" and the bust of Pericles in the British Museum. Realism does not enter portraiture till the age of Lysippus, who was especially celebrated for his portraits of Alexander the Great, copies of which survive in the well-known busts in the principal European museums. At the same time, portraiture was first practiced in painting by Apelles, also celebrated for his likenesses of Alexander. The only surviving portrait paintings of Greek art are those discovered in the Fayum, of Græco-Egyptian workmanship, good examples of which are in the Metropolitan Museum, New York (second century A.D.).

The realistic tendencies of the Etruscan art were favorable to portraiture, especially in bronze, the material in which the Etruscans excelled; a good example is the bust of Brutus in the Capitoline Museum at Rome. Their art had a strong influence upon the Roman, which was, however, even more influenced by Greece in the development of portraiture, which became the most characteristic form of Roman sculpture. As with the Greeks, the body was portrayed as a type, in the ideal fashion, the resemblance to the individual being confined to the face. Costumes and insignia were portrayed with much elaboration. Busts were especially popular, and it became quite the fashion to collect them. (See BUST.) Beginning with the Empire, portraiture flourished at Rome until about the beginning of the third century, and about the time of Justinian, in the sixth century, it sank into disuse. A very common form of portraiture under the Empire was upon ivory diptychs, which Roman, civil, and ecclesiastical officials distributed among their friends. This practice was continued by the Byzantines, who also used mosaics for portraiture, as may be seen in the celebrated examples of Justinian and Theodora in San Vitale, Ravenna.

The chief use of portraiture during the Middle Ages was for sepulchral figures, which were carved recumbent, seated, or kneeling. Attempts at portraiture are often apparent in the faces of the statues of the Gothic cathedrals in France, and in the thirteenth century it attained a splendid development in the statues of donors, erected in German cathedrals of the transitional period, as at Naumburg and Bamberg. These likenesses were of an ideal character, but a more realistic portraiture was practiced in the latter fourteenth century, especially by the Netherlandish school, with centre at Dijon. The chief master was Claux Sluter, and the statues produced were the most realistic portraits imaginable. The element of portraiture was dominant even in the religious painting of Jan van Eyck and the early Flemish school; he and others, like Rogier von der Weyden, Hans Memling, and Quinten Matsys, painted admirably realistic portraits of highly detailed finish.

In so naturalistic an age as the early Renaissance portraiture flourished to a high degree. It was first practiced at Florence by the sculptors, Donatello having revived the art in the form in his busts, which unite excellent characterization with an admirable naturalism, tempered by the antique. The art was continued by Desiderio da Settignano and other marble carvers of the sixteenth century, and with high success in bronzes by Verrocchio. It was not practiced during the first half of the fifteenth century by the realistic painters of Florence, chief among whom was Castagno, or by Filippo Lippi; but during the latter half Botticelli, Ghirlandaio, Pollaiuolo, and others attained high success. In northern Italy Pisanello of Verona, the first important Italian portraitist, executed both medals and painted portraits in profile form. In the next generation Mantegna at Padua and Giovanni Bellini in Venice achieved noble likenesses, as did Piero della Francesca in central Italy. The sixteenth century united with realism and subjective conception an ideal rendering of the subject, which made the portrait typical in the highest sense. This success was attained by most of the chief masters of the Renaissance, such as Leonardo, Andrea del Sarto, Raphael, and Lorenzo Lotto; among the Venetians by Giorgione, Palma Vecchio, Titian, Tintoretto, and by Morone of Brescia. During the same period the Germans practiced portraiture of quite a different type, less refined in form and more careful in detail, but with strong characterization in the work of men like Dürer, and with a perfect, objective realism in that of Holbein, who was active chiefly in England.

Since the sixteenth century portraiture has found its chief expression in painting. Even during the decline of the Italian and other schools portraiture remained comparatively good, because in it the artist is compelled to adhere to nature. With the great development of painting in the seventeenth century, portraiture assumed a new importance, especially in the schools that attained the highest development, viz., those of the Netherlands and of Spain. In Holland Rembrandt, by the skillful manipulation of light and shade and by skillful coloring, achieved highly poetic, yet realistic and characteristic, results. Frans Hals, whose chief activity was in portrait painting, portrayed his figures in full light and with genial observation;

while Van der Helst and many others did good work in portraiture. This school developed the group picture and heightened the effect of the portrait by an appropriate background. The work of the Flemish school represents a modification of the purely realistic conception by Italian refinement of color. Rubens's portraits were of wonderful strength and characterization, while Van Dyck's were of a more refined and courtly character. In Spain portraiture attained the highest possible development in the works of Velazquez, who with the subtlest intellectual observation and the highest technique portrayed his royal and noble sitters from the standpoint of absolute realism. During the same period portraiture of good, though of a more artificial, character was practiced by the Eclectic schools in Italy and by the courtly painters of France.

In France, under Louis XVI, Largillière and Rigaud painted majestic but artificial likenesses, while Philippe de Champagne was more natural. During the rococo period portrait painting was more natural and pleasing, though flippant, in the canvases of artists like Nattier and the pastels of Quentin de la Tour. It found strong and realistic presentation in the productions of sculptors like Houdon and in the work of the great portrait engravers Nanteuil and Edelinck. During the eighteenth century there developed in Britain a strong school of portraiture influenced by the old masters, but based on a pleasing conception of nature. Among its chief representatives were Hogarth, Reynolds, Gainsborough, Romney, and Lawrence, and Raeburn (in Scotland).

Nearly all the great figure painters of the nineteenth century tried their hands at portraiture. The best productions of the French Classicists, like David and Ingres, are their portraits; among the Realists Courbet, Bonnat, Carolus Duran, Benjamin Constant, and Fantin-Latour are especially known as portraitists, and among the Impressionists Renoir and Besnard. In Germany by far the foremost portraitist was Lenbach, who with good color and excellent characterization depicted the men who created the German Empire. Mention should also be made of the younger Kaulbach and of Arthur Kampf. The foremost portraitists in England include Millais, Frank Holl, and Watts of the past generation, and Shannon, Lavery, P. W. Steer, and William Orpen of the present. The foremost Italian portraitist is Boldini; in Spain Sorolla and Zuolaga are best known, and in Sweden, Zorn. The sculpture of the nineteenth century in all European countries has been concerned chiefly with monumental portraits. See Sculpture.

Virtually all American painting of the early period was portraiture under British influence. The chief portraitist of the Colonial epoch was Copley; of the Revolutionary, Gilbert Stuart, who in characterization and brushwork excelled his contemporaries, Trumbull and the two Peales. During the middle period (1825–80) the principal portraitists were Harding, Healy, Huntington, Page, and Eastman Johnson. But by far the best portraiture in the United States, beginning with refined likenesses by Whistler, has been done chiefly in recent years by men of European training. Among the foremost of recent American portraitists have been Sargent, a brilliant and facile realist, W. M. Chase, J. W. Alexander, Irving Wiles, Thomas Eakins, Carroll Beckwith, B. C. Porter, Louise Cox, Cecilia Beaux, Melchers, and Robert Henri, whose portraits rise to the dignity of types. The invention of the photograph has deprived portraiture of one of its chief reasons for existence, and the technical progress in this branch has been less marked than in others. An important variety of portraiture, miniature painting (q.v.), is treated under a separate heading.

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PORTREE′. The seaport and chief town of Skye Island, Inverness, Scotland (Map: Scotland, B 2). See Skye.

PORT′REEVE (AS. *portgerēfa*, from *port*, port + *gerēfa*, reeve, probably from *ge-*, generalizing prefix + **rōf*, OHG. *ruova*, Icel, *rōf*, number, or from *rōf*, famous, Goth. *hrōps*, OHG. *ruof*, Ger. *Ruf*, outcry, AS. *hrōpan*, to cry out). The principal magistrate in a maritime town. The chief officer under the Saxons in London was called the portreeve, and the early mayors of that city and elsewhere were so designated, but the word gradually came in time to mean a chief magistrate and sheriff of a port, whose duties were to represent the crown, preserve order, and collect the revenues. The term is still used in certain parts of England to designate a port warden.

PORT RÉPUBLICAIN, pôr rȧ′pụ′blē̇′kăɴ′. The capital of Haiti. See Port-au-Prince.

PORT ROYAL. The principal station of the British naval forces in the Caribbean, on the island of Jamaica, West Indies (Map: Cuba, J 9). It is situated on a sandy spit at the entrance to Kingston harbor, and contains an arsenal, barracks, and a military hospital. The old Port Royal, which before its destruction by earthquake in 1693 was one of the chief towns of the West Indies, stood near the site of the present town.

PORT ROYAL. A town in Beaufort Co., S. C., 81 miles by rail northeast of Savannah, Ga.; the terminus of the Port Royal and Augusta Railroad, and on the Beaufort River (Map: South Carolina, D 4). Pop., 1910, 363. In this vicinity, in 1664, Captain Ribault, at the head of a company of French Huguenots, built a fort, which, in the following year, was taken by a force of Spaniards under Menéndez, who massacred all the garrison; and in 1686 Lord Cardross founded a town, which was almost immediately broken up by the Spaniards. At the outbreak of the Civil War the entrance to Port Royal Sound, some distance below the town, was fortified by the Confederates, Fort Beauregard being built north of the entrance and Fort Walker south of it. Against these fortifications a strong Federal squadron, consisting of two frigates, three sloops, and seven gunboats, all under Captain (later Rear Admiral) Du Pont, was sent late in 1861, and on November 7 the forts were captured and the harbor secured. The Confederate forces at this point were commanded by Gen. Thomas F. Drayton. The Federal loss in killed and wounded was about 30, that of the Confederates about 50. Consult Johnson and Buel (eds.), *Battles and Leaders of the Civil War*, vol. i (New York, 1887).

PORT-ROYAL-DES-CHAMPS, pōr-rwä′yȧl′ dȧ-shäɴ′. A convent of the Cistercian or Bernardine nuns, near Versailles, which obtained much celebrity during the seventeenth century as a centre of Jansenism. It was founded by the wife of Mathieu de Montmorency in 1204, and soon after its establishment obtained from the Pope the privilege of receiving lay persons who, without taking monastic vows, desired to live in religious retirement. The discipline of the convent was much relaxed in the fifteenth and sixteenth centuries, and the superior was appointed from worldly or political motives. In 1602 Angélique Arnauld (q.v.), sister of the celebrated brothers Arnauld, was appointed, when a child, coadjutrix of the abbess, whom she succeeded at the age of 11. As the new abbess advanced in years she undertook a reformation of the community, demanding a strict observance of religious poverty, abstinence from meat, complete seclusion, and the most severe ascetic exercises. The community removed to Paris in 1626, because of the malarial situation of Port-Royal, and in 1633 obtained a new convent, which was thenceforward called Port-Royal-de-Paris; and from this time the old establishment of Port-Royal-des-Champs was the home of a lay community in accordance with the original papal privilege. This community became very celebrated, and numbered among its inmates some of the most distinguished scholars of the time. The rule of life of the Port-Royalists was austere, and they devoted many hours to prayer, spiritual reading, instruction, and manual labor.

In 1643, inspired by profound love for children, the Port-Royalists founded the Little Schools, first at Port-Royal and then in Paris, in which they received a small number of pupils. They prepared for these schools the well-known textbooks of the Port-Royal series, such as Greek and Latin grammars, works on general grammar, geometry, and logic. The study of the vernacular was strongly emphasized, the general aim being to develop the reason, judgment, and power of personal reflection rather than a mastery of Latin. For the first time in the history of French education, the study of French received careful consideration.

Greater importance for the time was given to the community by its pertinacious adherence to the Jansenist views (see JANSENISM) and by the number of polemical works which issued from Port-Royal. In 1648 some of the nuns returned to Port-Royal, and there was a revival of the convent. But later, the nuns having refused to subscribe the formula condemning the five propositions of Jansenius, a royal order was issued in 1660 for the suppression of the school and the removal of the boarders, and the abbess and several other nuns were arrested and confined as prisoners in other monasteries. After the "peace of Clement IX" they were permitted to return; but the two communities, Port-Royal-des-Champs and Port-Royal-de-Paris, were placed under separate government. This led to many disputes and to a continued adherence at Port-Royal-des-Champs to the Jansenist spirit and opinions; and when the final steps for the repression of the Jansenists were taken in 1705 and the following years, a formal bull was issued by Pope Clement XI for the suppression of the old convent and the transfer of its property to Port-Royal-de-Paris. In 1709 the nuns were finally dispersed and distributed among convents of different orders throughout France. The property of the convent and church was transferred to the Paris house, and all the buildings of Port-Royal-des-Champs were leveled to the ground by order of the King.

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PORT SAID, sȧ-ēd′. An important seaport of Egypt, situated at the Mediterannean end of the Suez Canal (Map: Egypt, C 1). Its harbor, with colossal piers of concrete, has ample docks and accommodations for vessels. It is noted for its lighthouse, whose light is visible 24 miles out at sea. Port Said has an export trade in cotton, and is an important coaling station. Large salt works exist on the east side of the harbor. It is the seat of the Governor-General for the Suez Canal. The town dates from 1859, when work on the canal was begun. Pop., 1911, 54,400, of whom about one-fifth are Europeans.

PORTSMOUTH, pôrts′mŭth. A county borough, seaport, and the chief naval arsenal of Great Britain, situated in Hampshire, on the southwest shore of Portsea Island, 74 miles southwest of London (Map: England, E 6). Portsmouth has the most complete fortifications in Britain. These comprise, on the landward side, the outer line of the Portsdown forts and the Hilsea lines; to seaward, the Spithead forts.

Southsea, which is situated outside the walls skirting Southsea Common, is rapidly increasing, and is a fashionable watering place. From the ramparts and batteries pleasing views may be had of the harbor, the roadstead of Spithead, and the Isle of Wight. The town itself is uninteresting. Among the few notable buildings is the church of St. Thomas à Becket; the chancel and transepts date from the twelfth century. The town of Gosport (q.v.) is separated from Portsmouth by the harbor entrance. Portsmouth harbor, about 220 yards wide at its entrance, extends inland for about 4 miles and has a breadth of 3 miles along its northern shore. The outward entrance is defended by Monkton Fort and Southsea Castle. The harbor is situated close to the magnificent anchorage of Spithead, where numerous battleships may ride without inconvenience, under shelter of the Isle of Wight. The government dockyard has an area of 293 acres. Of this vast naval establishment the most noteworthy features are the dry docks, spacious enough to admit the largest vessels.

The local trade of Portsmouth is supported mainly by the government dockyard and other public establishments. Brewing is carried on, and there is considerable traffic in timber, coal, cattle, and agricultural produce. The importance of the port dates from the reign of King Henry VIII. Its defenses were strengthened by Elizabeth and by William III. The municipality holds various charters, the first granted by Richard I in 1194. Its principal asset is its docks. It owns an electric-lighting plant and tramways, and maintains public baths, cemeteries, libraries, and a technical school. As a parliamentary borough Portsmouth returns two members. Portchester Castle, a ruined Norman fortress to the north of the harbor, occupies the site of the Roman Portus Magnus. The town was burned by the French in 1372. In 1642 it was taken by the Parliamentarians. In 1782 the *Royal George* sank in the harbor with a loss of nearly 1000 lives. Portsmouth is the birthplace of Charles Dickens and George Meredith. Pop., 1891, 159,981; 1901, 188,928; 1911, 231,141. Area, 6100 acres. Consult W. H. Saunders, *Annals of Portsmouth* (London, 1880).

PORTSMOUTH. A city and one of the county seats of Rockingham Co., N. H., 57 miles by rail north-northeast of Boston, on the Piscataqua River, about 3 miles from the Atlantic Ocean, and on the Boston and Maine Railroad (Map: New Hampshire, J 7). It is a port of entry and the only seaport in the State, situated on a peninsula overlooking the harbor, which is very deep and commodious, fortified, and dotted with islands that make the site of the city very picturesque. On one of the islands, formerly called Fernald's Island, is the United States navy yard, the place of construction of such famous vessels as the *Ranger* and the *Kearsarge.* Many of the islands in this vicinity, particularly the Isles of Shoals, are noted summer resorts. Portsmouth itself is a well-known resort, attractive for its fine situation and for the historic interest of its Colonial mansions, several of which are still standing. It is also closely connected with the popular watering places of the coast.

There are three parks, Goodwin, Langdon, and Haven, and a large playground. Among the edifices of note are the old residences of Governors Wentworth and Langdon, St. John's Church, the Federal government building, and the Portsmouth Athenæum, with a museum and library. The city has also a public-library building, designed by Charles Bulfinch in 1809, and several charitable institutions. Portsmouth is of considerable importance as a manufacturing centre, its establishments including a large shoe factory, several breweries, a shoe-button factory, and manufactories of locks, iron forgings, and boot and shoe heels. There are also marble and granite quarries. The government, under a revised charter of 1905, is vested in a mayor, annually elected, a unicameral council, and in administrative officers, among whom the police commissioners are appointed by the State Governor. Pop., 1900, 10,637; 1910, 11,269; 1915 (U. S. est.), 11,602.

Portsmouth was settled in 1623 by the Laconia Company, headed by Sir Ferdinando Gorges and Captain Mason, and for many years was known as Strawberry Bank. Before New Hampshire was organized in 1679, Portsmouth lay within the limits of Massachusetts. It was incorporated as a town and named Portsmouth in 1653, and in 1849 it was chartered as a city. Until 1807 it was the capital of the State. In 1905 the treaty ending the Russo-Japanese War was signed here.

PORTSMOUTH. A city and the county seat of Scioto Co., Ohio, 115 miles east-southeast of Cincinnati, at the junction of the Ohio and Scioto rivers, at the terminus of the Ohio Canal, and on the Baltimore and Ohio Southwestern, the Norfolk and Western, and the Chesapeake and Ohio railroads (Map: Ohio, D 8). Several steamboat lines add to the transportation facilities. Situated on a plain in a productive agricultural region, with considerable mineral wealth, the city is an important industrial and commercial centre. It has a Carnegie library, a city hospital, and homes for old ladies and children. There are several attractive parks—Grandview, Millbrook, Tracy, York, and Athletic. The Scioto valley is famous among archæologists for the many remains of the mound builders.

The manufacturing interests of Portsmouth are developing rapidly. There are large shoe factories, fire-brick, paving and building brick plants, gasoline engine and tractor works, stove and range works, car shops, planing mills, foundries and machine shops, furniture and veneering factories, hub and spoke works, stone saw mills, rolling mills, paper-box factories, a brewery, and a distilling and rectifying plant. The government is administered by a mayor, elected every two years, and a unicameral council. Most of the subordinate officials are appointed by the mayor and confirmed by the council, or elected by that body. The following important officers, however, are chosen by popular vote: city solicitor, city auditor, city treasurer, members of the school board, ward assessors, and justices of the peace. Portsmouth was settled in 1803 and was incorporated in 1814. Pop., 1900, 17,870; 1910, 23,481; 1915 (U. S. est.), 28,126.

PORTSMOUTH. A town and the county seat of Newport Co., R. I., 9 miles northeast of Newport, on the New York, New Haven, and Hartford Railroad (Map: Rhode Island, C 3). It is in an agricultural and fruit-growing region, and contains a public library. Pop., 1900, 2105; 1910, 2681.

PORTSMOUTH. A city and the county seat of Norfolk Co., Va., on the Elizabeth River, opposite Norfolk, with which it is connected by ferry (Map: Virginia, H 5). The two cities, constituting in reality a single municipality, possess a fine harbor and good transportation facilities, being on the Albemarle and Chesapeake and the Dismal Swamp canals, on several steamship lines, and on the following railroads: Atlantic Coast Line, Chesapeake and Ohio, New York, Philadelphia, and Norfolk, and the Seaboard Air Line. The value of the foreign commerce of the Norfolk-Portsmouth customs district aggregated, in 1913, $17,723,000, of which $15,611,000 was for exports. See NORFOLK.

Portsmouth, in contrast with Norfolk, is regularly laid out, and is the home of many business men of the greater city. Its chief features include the United States Navy Yard (situated in the southern part of the city), which has three large dry docks and a plant for the construction of steel vessels, the naval training station, naval magazine, and the United States Naval Hospital and park in the northern portion of the city. Other noteworthy structures are the King's Daughters Hospital, public library, armory, Y. M. C. A., homes for the aged and for orphans, and the Kirn, Commercial, and Law buildings. Trinity Church, erected in 1762, is also of interest. There are in Portsmouth extensive cotton mills, smelting works, cottonseed-oil mills, utilization works, lumber and knitting mills, hosiery and dye works, a fibre plant, and railroad shops of the Seaboard Air Line. There are also important garden-truck, oyster, fish, and crab interests. The city manager plan of government was adopted in 1915. The city council consists of seven members, the presiding officer being ex-officio mayor. Settled in 1752, Portsmouth was chartered a city in 1858. Before the Revolutionary War the British operated a shipyard on the site of the present navy yard. Pop., 1900, 17,427; 1910, 33,190; 1915 (U. S. est.), 38,610.

PORTSMOUTH, PEACE OF. See RUSSO-JAPANESE WAR.

PORT TAMPA CITY. A city in Hillsboro Co., Fla., 9 miles south of Tampa, on Tampa Bay (Map: Florida, D 4). It is the southern terminus of the Atlantic Coast Line Railroad, which here connects with steamers for Havana, Key West, Mobile, and other points, and has excellent harbor facilities. The town is the centre of a fertile region producing large quantities of phosphate, oranges, pineapples, and vegetables, and is the shipping port of Tampa (q.v.). It has also some reputation as a health resort. Port Tampa City was settled in 1889 and was incorporated four years later. It was the place of embarkation of the Santiago expedition in the Spanish-American War. Pop., 1900, 1367; 1910, 1343.

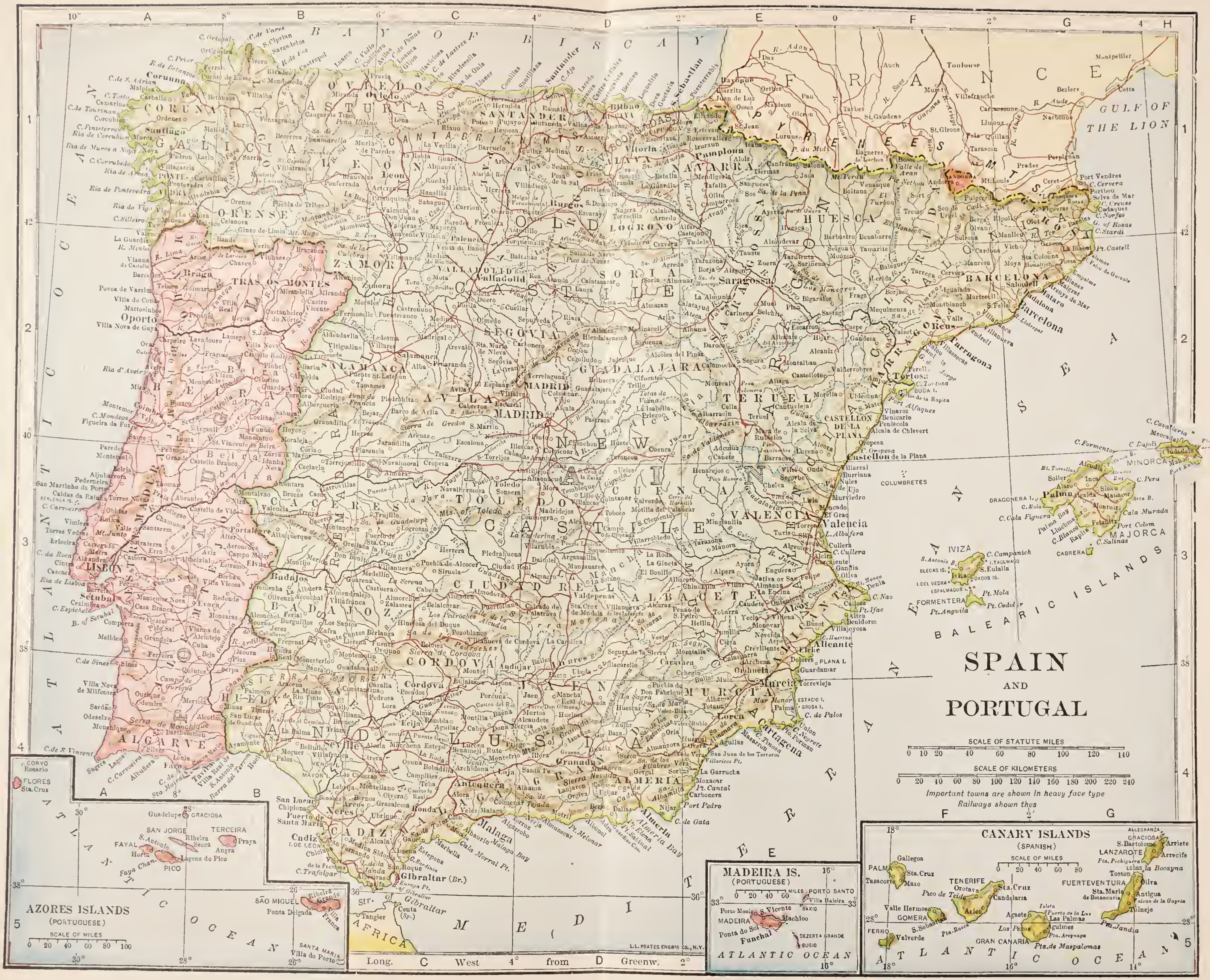
PORT TOWNS'END. A city and the county seat of Jefferson Co., Wash., 40 miles north by west of Seattle, direct, on Port Townsend Bay, at the entrance to Puget Sound. It is on the Northern Pacific Railroad, and has steamship connection with Alaska, San Francisco, and various ports of the Orient (Map: Washington, C 2). The harbor is one of the largest in the world, and is protected by three well-equipped forts. The city is favored with an equable climate, owing to the influence of the Japan Current, and is surrounded by picturesque mountain scenery. It is well laid out, and has fine business blocks, parks, public buildings, and private residences. Among the noteworthy edifices are the United States customhouse, county courthouse, city hall, school buildings, public library, United States Marine Hospital, St. John's Hospital, the Northwestern Sanitarium, and the United States Quarantine Station.

The neighboring region is engaged in lumbering, fishing, dairy farming, and fruit growing, and has also considerable oil and mineral wealth. Port Townsend is a port of entry for the Puget Sound customs district, the trade of which in 1913 was valued at $114,021,792, including exports to the amount of $62,548,109. Lumber, grain, farm and dairy products, live stock, fish, and oil are the chief articles of commerce. The industrial establishments comprise steam-boiler works, machine shops, saw and planing mills, a shipyard, salmon canneries, herring pickling and curing works, bottling works, etc. Under the charter of 1890 government is by a mayor, chosen annually, and a unicameral council. Port Townsend was settled in 1851 and was incorporated in 1860. Pop., 1900, 3443; 1910, 4181.

POR'TUGAL. One of the smaller states of Europe, occupying most of the western part of the Iberian or Pyrenean Peninsula. Comprised between the parallels of 37° and 42° N. and the meridians of 6° 15′ and 9° 30′ W., it has a continental area of 34,254 square miles, a little larger than Maine. The Azores and Madeira Islands, classed as an integral part of the Republic, have an area of 1236 square miles, making the total area 35,490 square miles. The colonial possessions are nearly 23 times as large as the Republic itself. Portugal is bounded on the north and east by Spain and on the south and west by the Atlantic Ocean. It extends about 350 miles from north to south, and has an average width of about 100 miles from east to west. No country is better provided with natural boundaries. Rivers or mountain ramparts separate it from Spain. The Minho, Douro, Tagus (Tejo), and Guadiana, flowing in deep valleys, form boundaries in parts of their courses. Portugal may almost be said to have a climatic boundary. The limit of rains brought by the westerly winds from the Atlantic coincides very nearly with the political boundary. On the side of Portugal are a humid atmosphere, copious rains, and luxuriant vegetation. On the side of Spain are cloudless skies, a thirsty soil, and treeless plains.

Topography. The Republic occupies the greater part of the Atlantic slope of the great peninsular table-land. The country has a coast line of nearly 465 miles. The harbors are relatively numerous, though those in the north are obstructed by sand bars. The most important are those of Lisbon, in the widened estuary of the Tagus; Oporto, on the Douro, near its mouth; and Setubal (the famous salt port), at the head of Setubal Bay. Lagos, founded by the Carthaginians, and Villa Novo, both on the south coast; Buarcos and Figueira, at the mouth of the Mondego; and the roadstead of Leixões, near Oporto, where an artificial harbor has been built, are smaller ports. It was partly due to the superior situation of the ports for intercourse with west Africa and South America that Portugal stood in the forefront of over-sea enterprises in the greatest era of geographic discovery.

A large part of the interior is filled with mountains. The country north of the Tagus is most mountainous and elevated. Of the three great mountain systems the fine Serra do Gerez of the north is the western extremity of the Pyrenean system, and the magnificent Serra da Estrella, between the Douro and the Tagus, is the western prolongation of the great central range of Spain. They have many offshoots and foothills, and the Estrella Range traverses the great plain of the Province of Beira. The Tagus divides Portugal into two portions, which differ much in appearance, climate, and soil. North of the Tagus are imposing mountain chains, transverse hill ranges, beautiful and fertile valleys; but south of the river the mountains rarely assume the aspect of ranges and do not rise high above the surrounding plateau. Thus, south Portugal is the least attractive part of the Republic—a succession of plains, hills, thinly wooded lands, and sandy coastal tracts. It includes, however, the third conspicuous orographic system of the country, the Serra de



SPAIN
AND
PORTUGAL
SCALE OF STATUTE MILES
0 10 20 40 60 80 100 120 140
SCALE OF KILOMETERS
0 20 40 60 80 100 120 140 160 180 200 220 240
Important towns are shown in heavy face type
Railways shown thus
BAY OF BISCAY
FRANCE
GULF OF THE LION
ATLANTIC OCEAN
MEDITERRANEAN SEA
BALEARIC ISLANDS
AFRICA
PYRENEES MTS.
CANTABRIAN MTS.
GALICIA
ASTURIAS
LEON
OLD CASTILE
NEW CASTILE
NAVARRA
ARAGON
CATALONIA
VALENCIA
MURCIA
ANDALUSIA
ESTREMADURA
TRAS OS MONTES
BEIRA
ALEMTEJO
ALGARVE
MADRID
LISBON
Str. of Gibraltar
Gibraltar (Br.)
ANDORRA
MAJORCA
MINORCA
IVIZA
FORMENTERA
AZORES ISLANDS
(PORTUGUESE)
SCALE OF MILES
0 20 40 60 80 100
MADEIRA IS.
(PORTUGUESE)
ATLANTIC OCEAN
CANARY ISLANDS
(SPANISH)
SCALE OF MILES
0 20 40 60 80
Long. C West 4° from D Greenw. 2°
L.L. POATES ENGR'G CO., N.Y.
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São Mamede, on the border between Portugal and Spain.

Hydrography. The principal rivers have their origin in Spain, the only important rivers entirely possessed by the Portuguese being the Mondego, which waters a fertile valley, but is useless for commerce, and the Sado in the region of the famous salt pans. The rivers Minho, Douro, Tagus, and Guadiana are generally navigable as far as the Spanish frontier, and in the lower part of their courses even for large vessels. The Tagus is deep enough for seagoing ships for 90 miles, and the Douro as far as Oporto. While the rivers are very important in the communications of the country, they have not been effectively regulated for purposes of navigation. The Minho River forms part of the north boundary between Spain and Portugal; its valley is very fertile, and its salmon and lamprey fisheries are important. The Douro irrigates the vine regions which produce the famous port wine exported from Oporto. The lower Tagus crosses plains of great fertility, and widens at Lisbon to a great basin, one of the largest and finest harbors in the world.

Climate. Although not a large country, Portugal has a varied climate, owing mostly to the great differences in altitude. In the north it is cold and damp. High degrees of temperature are registered only in the south, and, owing to the neighborhood of the sea, the climate may generally be described as temperate. North of the Douro the mean annual temperature is 50° F., between the Tagus and Douro about 60° F., and in the Guadiana valley 65° F. Lisbon has a mean temperature in January of 50° F. and in July of 69.8° F. The prevailing winds blow from the northeast and the northwest, being of a monsoon character. The precipitation at Lisbon is about 40 inches a year, and Coimbra, the most populous town between Oporto and Lisbon, is the rainiest place in Europe, the clouds parting with their moisture against the sides of the surrounding mountains, where as much as 192 inches of rain have fallen in a year. On the whole the soils are not rich, for there are wide expanses of sandy and thin soils; some of the valleys and plains, however, are extremely fertile.

Flora. The vegetation, which is that of central and south Europe, is practically identical with the flora of Spain. The kind of vegetation is denoted by the prevalent forest trees—in the north the oak, in the middle the chestnut, and in the south the cork tree. The culture of the orange is extended the entire length of the coast. In the extreme south fig and carob trees are abundant, and wine is produced in large and increasing quantities. The olive is found everywhere, but the date palm is limited to a fringe along the south coast.

Fauna. The wild animals are those of Spain. Sardines and the tunny are most conspicuous in the coast fisheries, which are highly productive.

Geology and Mineral Resources. Almost all the geologic formations are represented. Granite is predominant among the northern mountains, gneiss throughout the Douro valley, mica schists occur irregularly here and there, and basalt is conspicuous in the surroundings of Lisbon. The older fossiliferous formations (Paleozoic) are conspicuous in the north and centre and cover most of south Portugal. Mesozoic formations occur along the coast between Lisbon and Aveiro, and several mountain chains in the central regions are formed of Jurassic rocks. Portugal suffers occasionally from the seismic disturbances which afflict the peninsula. The great earthquake of 1531 did enormous damage, and that of 1755, in which only one-quarter of Lisbon escaped destruction, was probably the most violent ever witnessed in Europe. The most important mines are in the copper region of Alemtejo and among the iron ores of Moncorvo. Coal is worked at Cape Mondego and is also found in the environs of Leiria, but the supply is inadequate. The mining industry, however, is in an even worse condition than that of Spain. Many mines are idle for want of fuel and cheap transport, and those that are worked are for the most part in the hands of foreigners. Very large quantities of salt, chiefly sea salt (at Setubal, 300,000 tons annually), are produced, and much is exported. The Portuguese sea salt is regarded as the best in Europe.

Agriculture. Statistics relating to the cultivated area of continental Portugal were published in 1913, but are for the year 1902. Out of a total area of 8,910,640 hectares, 5,067,763 hectares, or 56.87 per cent, were cultivated. Of the total cultivated area there were under cereals, pulse, grass, vegetables, etc., 2,337,775 hectares (46.13 per cent); the vine, 313,165 hectares (6.18); the olive, 329,156 (6.50); fruits, 131,221 (2.59); chestnuts, 83,988 (1.66); the holm oak, 416,670 (8.22); the cork tree, 366,002 (7.23). Of the total area 34.92 per cent was devoted to agriculture proper, 21.95 per cent was forest (including the cork tree, holm oak, and chestnut), and 43.13 per cent was unproductive. Farming is in a low state of development, and methods and implements are very primitive. There are three principal regions of cereal culture: that of maize, chiefly north of the Tagus River, where the climate is more humid than in the south; that of wheat, on the wide, dry, warm plains south of the Tagus; and that of rye, on the poorer dry soil and in the colder temperature of the eastern lands bordering Spain. Flax is extensively grown in the north, and citrus fruits and olives are produced in the south. Vine growing, the most noted branch of Portuguese husbandry, is of great importance, particularly on the Douro, where port wine is produced. Though the industry is carried on in somewhat antiquated fashion, Portugal is one of the leading wine countries, judged by the quality of its wine. The yield in 1908 was 6,869,400 hectoliters.

Live-stock raising is an important branch of agriculture. In 1906 there were 87,765 horses, 144,089 asses, 57,647 mules, 703,198 cattle, 3,072,988 sheep, 1,034,218 goats, and 1,110,957 swine. Cattle are raised in largest numbers in the valleys and on the plains of the north, while sheep and swine are found chiefly in the south. Silkworm culture is increasing, particularly in the north.

Manufactures. The manufacturing industries have only inferior development, but they are progressing, especially in Oporto and Lisbon. The chief manufactures are textiles, particularly woolens, and also cotton, linen, and silk goods. The cottons are made chiefly for export to the colonies. The chief seats of these manufactures are Lisbon, Oporto and the neighboring Braga, and Covilhão. Other products are hats, leather, spirits from sugar cane, porcelain, tobacco, shoes, ironware, brandy, and soap.

Shipbuilding has been increasing in importance within the last few years.

Commerce. The average annual foreign trade, in millions of dollars, may be seen in the following table:

	1891–95	1900–04	1912
Imports	44.3	63.5	80.5
Exports	38.1	32.2	37.1

The foregoing figures represent the special trade in merchandise. There is in addition a considerable exportation of colonial produce: this in 1911 included cacao to the value of 7,083,000 escudos and rubber to the value of 4,032,000 escudos (the escudo = $1.08). In the special trade in 1912 imports and exports were valued at 74,639,000 and 34,325,000 escudos; specie, 1,072,000 and 641,000. Leading imports include cotton, cotton goods, wheat, coal, metals, and sugar. The principal export is wine, which in 1911 was valued at 11,933,000 escudos (of which common wine 5,397,000, port 5,678,000); the other principal exports were: cork, 4,378,000 escudos; live stock, 3,943,000; fish, 3,104,000; southern fruits, 1,635,000; cotton goods, 1,185,000; wood, 905,000; copper, 869,000; olive oil, 544,000. In 1911 imports from the United Kingdom and exports thereto were valued at 19,398,000 and 6,935,000 escudos respectively; Germany, 12,128,000 and 3,300,000; United States, 5,835,000 and 842,000; Belgium, 5,267,000 and 1,070,000; France, 5,238,000 and 1,359,000; Spain, 5,106,000 and 5,764,000; Brazil, 1,854,000 and 6,316,000.

Communications. The domestic trade is much facilitated by the rivers. The wagon roads have been improved and extended in late years. In 1853 the first railway was opened, between Lisbon and the Spanish frontier. At the beginning of 1913, 1854 miles of railway were in operation, of which 713 miles belonged to the state. The railway lines are practically adequate to the needs. The coasting trade is very active. The chief ports in the foreign trade are Lisbon and Oporto. In 1912 there were entered at all the ports 11,134 vessels, of 23,197,000 tons (of which, steamers 7846, of 22,887,000 tons). The larger proportion of the shipping is under the British flag. In 1911 the Portuguese merchant marine numbered 66 steamers, of 70,193 tons, and 259 sail, of 43,844 tons. Regular shipping communication is maintained with many ports, as the steamers of most lines plying to South America, western Africa, the Mediterranean, and eastern Asia touch at Lisbon, and in many cases at Oporto also.

Banking and Currency. The present currency system of Portugal, established by a decree of the provisional government May 22, 1911, made the monetary unit the gold escudo, the value of which is $1.08 in United States currency; it is also equal to the gold milreis, the former unit of currency. The gold coin issued since 1854 is equal to about 8,000,000 escudos, and the silver coinage about 38,000,000 escudos. The gold escudo is issued in 2, 5, and 10 escudo pieces; the silver coins are the 1 escudo piece and 50, 25, and 10 centavo pieces. The exchange value of the inconvertible paper milreis is quoted by the United States Treasury Department in 1915 at about 94 cents. There is little gold in circulation.

The number of banks is about 30, but the Bank of Portugal, with head office at Lisbon, has 22 branches in as many cities and towns. It has the right of issue, and its notes issued up to 1914 amounted to 103,000,000 escudos. Its paid-up capital is 13,500,000 milreis, and the deposits, current accounts, etc., were, in 1914, 10,798,000 milreis. The Banco Lisboa and Açores has a paid-up capital of 4,500,000 escudos; securities deposited, 74,000,000 milreis. The Banco Ultramarino, with a capital of 7,200,000 escudos, has branches in Brazil and in the principal Portuguese colonies.

Education. Elementary instruction has been nominally compulsory since 1844, provided schools were available, but the law was not generally enforced until the promulgation of a decree of 1911. Portugal, indeed, has been notorious for its illiteracy. At the 1911 census the population of Portugal (including the Azores and Madeira) over six years of age numbered 4,262,221; of these 2,855,067 (1,117,273 males, 1,737,794 females) could not read. In 1911 there were about 7120 elementary schools (6320 public, 800 private); public secondary schools numbered 32, with 9749 students, and in 1912 with 10,621. Private secondary schools are maintained and also several schools for industrial, commercial, and technical training. There are three universities, at Coimbra, Lisbon, and Oporto; students in 1912, about 2700. See COIMBRA, UNIVERSITY OF.

Religion. The state religion was Roman Catholic (other religious forms being tolerated) until the advent of the republican government, which separated church and state. There are a few Protestants, chiefly foreigners. The country is divided into three ecclesiastical provinces, with their seats at Lisbon, Braga, and Evora. A patriarch presides at Lisbon, and if he is not a cardinal when he enters office, he receives that dignity as soon as a place is vacant in the Sacred College. Braga and Evora are under the jurisdiction of archbishops. In 1834 the 632 monasteries and 118 nunneries with over 80,000 nuns and monks and an annual income of nearly $5,000,000, were suppressed and their property confiscated for the benefit of the state. Subsequently a number of similar establishments were formed, but they were suppressed by the Republic.

Finance. The budget for 1914–15 showed estimated revenue and expenditure (ordinary and extraordinary) of 79,649,140 and 83,390,965 escudos respectively. The indirect taxes (including customs) were estimated at 25,680,200 escudos; direct taxes, 13,078,550; registration and stamps, 10,615,300; the remaining revenue is derived principally from state enterprises (including monopolies) and investments. The largest expenditure is for the public debt, 28,401,352 escudos; other estimated disbursements were for the Ministry of War, 10,738,777 escudos, and public works, commerce, and industry, 10,806,979.

At the end of 1913 the public debt stood at 889,085,870 escudos. The foreign debt amounted to 175,396,150 escudos, of which the sum of 138,445,920 escudos was at 3 per cent and the remainder at 4 and 4½ per cent. The internal debt was 713,689,720 escudos, including the consolidated debt, 565,134,076 escudos at 3 per cent, and a floating debt of 87,296,642 escudos.

Weights and Measures. The metric system is the legal standard of weights and measures, but the old weights and measures also are in use.

Dependencies. The Portuguese dependencies are given in the table below. Published figures differ with respect to some of the areas; the figures here given in square miles correspond to an official statement in square kilometers published in 1913. The population figures are the most recent reliable estimates available (the figure for Timor, however, is for 1902).

	Sq. miles	Population
In Africa:		
Province of Cape Verde (islands)	1,516	142,552
Province of Guinea	13,948	820,000
Province of São Thomé and Príncipe (islands)	364	68,221
Province of Angola	484,855	4,200,000
Province of Mozambique	293,436	3,150,000
Total	794,119	8,380,000
In Asia:		
Province of India (Goa, 1301 sq. miles; Damão, 148; Diu, 20)	1,470	604,930
Province of Macao	4	74,866
Total	1,474	679,796
In the East Indies:		
District of Timor	7,332	150,299
Grand total	802,925	9,210,000

Population. Census returns show that the population of Portugal has increased as follows: Jan. 1, 1864, 4,188,410; Jan. 1, 1878, 4,550,699; Dec. 1, 1890, 5,049,729; Dec. 1, 1900, 5,423,132; Dec. 1, 1911, 5,960,056. In 1911 males numbered 2,828,691 and females 3,131,365; the proportional excess of females appears to be greater than in any other European country, there being 110.7 females for each 100 males. The density of population was 168 per square mile. Of the total population 60.7 per cent were unmarried, 33.1 married, 0.1 divorced, and 6.1 widowed. In 1911 the population seven years of age and over numbered 3,360,477, of whom 69.7 per cent could not read. In 1900 the urban population was 32.4 per cent on the continent and 37.5 on the islands. Foreigners numbered 41,197 in 1911, of whom 20,517 were Spaniards and 12,143 Brazilians. In 1912 there were 207,690 births and 119,317 deaths. Emigration in 1912, 88,929; in the period 1900–12, 1,496,004, chiefly to Brazil and the United States. There are few large cities. The populations of the largest in 1911 was: Lisbon, 435,359; Oporto, 194,009; Setubal, 30,436; Funchal (Madeira), 24,687; Braga, 20,844; Coimbra, 20,581; Evora, 17,911; Ponta Delgada (Azores), 16,179; Covilhão, 15,745; Faro, 12,680; Tavira, 11,665; Portalegre, 11,603; Aveiro, 11,523.

Area and population by provinces and their constituent districts are shown in the table given in the next column.

Defense. *Army.*—In Portugal liability for military service is universal and compulsory from 17 to 45 years, both inclusive, actual service beginning at 20. The 25 years of service is divided as follows: active army, 10 years; reserve, 10 years; territorial army 5 years. Initial recruit training for the active army lasts from 15 to 30 weeks, followed by two weeks in the field during the annual manœuvres. For purposes of military administration and recruitment there are three territorial districts, each furnishing a division on paper. The skeleton organization of the active army is: infantry, 35 regiments of 3 battalions each; cavalry, 11 regiments of 4 squadrons each; field artillery, 8 regiments with a total of 63 batteries of 4 guns each; 2 horse batteries; 9 mountain batteries; 20 garrison batteries; the necessary auxiliary and supply units. In peace the active army is limited to 2800 officers and 30,000 men. The reserve army, on paper, consists of 35 regiments of infantry, 8 squadrons of cavalry, and 24 field batteries, with provision for the necessary auxiliary and supply units. In addition there are maintained in peace a military police of 5000 men, of whom 800 are mounted, called the Republican Guard; and a Fiscal Guard of 5200 men. Both of these forces may be employed in the field in war.

PROVINCES AND CONSTITUENT DISTRICTS	Area in sq. miles	Population	
		1900	1911
Entre-Douro-e-Minho:			
Viana do Castelo	857	215,267	227,250
Braga	1,040	357,159	382,276
Pôrto	893	597,935	679,540
	2,790	1,170,361	1,289,066
Trás-os-Montes:			
Vila Rial	1,650	242,196	245,547
Bragança	2,514	185,162	192,024
	4,164	427,358	437,571
Beira Alta:			
Aveiro	1,065	303,169	336,243
Coimbra	1,508	332,168	359,387
Viseu	1,938	402,259	416,744
	4,511	1,037,596	1,112,374
Beira Baixa:			
Guarda	2,117	261,630	271,616
Castelo Branco	2,582	216,608	241,184
	4,699	478,238	512,800
Estremadura:			
Leiria	1,317	238,755	262,632
Lisboa	3,066	709,509	852,354
Santarêm	2,556	283,154	325,775
	6,939	1,231,418	1,440,761
Alemtejo:			
Portalegre	2,406	124,431	141,481
Evora	2,857	128,062	148,295
Beja	3,959	163,612	192,499
	9,222	416,105	482,275
Algarve (Faro)	1,938	255,191	272,861
Total, continent	34,263	5,016,267	5,547,708
Azores:			
Angra do Heroismo	281	73,332	69,957
Horta	304	55,233	50,055
Ponta Delgada	337	127,726	122,553
	922	256,291	242,565
Madeira (Funchal)	315	150,574	169,783
Total, islands	1,237	406,865	412,348
Grand total	35,500	5,423,132	5,960,056

Arms: infantry, a magazine rifle (6.5 millimeter), the Mauser-Vergueiro; field artillery, a 7.5 centimeter Schneider-Canet gun.

Colonial troops: regulars in the Azores, 2 regiments of infantry, 2 battalions garrison artillery; in Madeira, 1 regiment of infantry, 1 battalion garrison artillery. Native troops: in west Africa, Mozambique, India, etc., a total force of about 650 European officers, 2500 European noncommissioned officers, 7000 natives, the last being enlisted compulsorily. Budget, 1914–15, $11,088,405.

Navy.—See under Navies.

Ethnology. The Portuguese are the longest-headed people in Europe (cranial index, 75–77). In stature they are below the average (1.61–1.67 meters, or 5 feet, 3 inches to 5 feet, 5¾ inches in the south and an inch taller in the north). Blond hair is practically absent. Black hair is possessed by one-fifth of the population; in the remainder the hair is very dark. Portugal was engaged in the slave trade for nearly four centuries. During that period many thousands of African and Brazilian negroes finally settled in the provinces of Algarve and Estremadura, and a large mulatto contingent in the population is the result. Stone-age relics are common in Portugal. Megalithic monuments are also common, occurring in the shape of dolmens, from which the tumulary envelope has been removed. In the smaller ones the crypt is made up of four large dressed stones, covered by a fifth; in the more elaborate the chamber is larger, round or irregular in outline, and approached through an avenue. In them along with the dead are found implements of chipped and polished stone, weapons and ornaments, turquoise beads, etc. The most interesting remains of the classical epoch are the so-called *citanias,* hill cities or forts. Two of them crowning the summits of low mountains in the northwest corner of Portugal have been carefully explored. A long wide street is lined on each side with ruins of stone houses. The walls are built of large, irregular blocks well adjusted, the interiors being revetted with smaller stones. The foundations are round and are built up in spiral. A thatched roof, doubtless, was sustained by a central pillar of wood, the stone support of which is to be seen in many ground plans. On both sides of the door and along the wall are the remains of a penthouse sustained by six pillars, of which the stone bases yet remain. Pottery and glassware abound in them. Flagstones are covered with sculptures, and the walls are decorated with circles, coils, and frets. The latest coin found in any of them was of Constantine I (306–337). Inscriptions on some of the houses are in Roman letters.

Government. Portugal is a republic, proclaimed Oct. 5, 1910. Prior to that date the government was monarchical, under a constitution of 1826 with subsequent amendments. The executive authority was vested in the crown, hereditary in the house of Saxe-Coburg-and-Gotha-Braganza. The sovereign (king) was assisted by a council of state and acted officially through a cabinet of ministers responsible to the Lower House of the national Legislature. This body, the Cortes, consisted of the Chamber of Peers and the Chamber of Deputies. The Deputies, 155 in number, were elected for four years by male citizens who were 25 years or more of age and who could read and write or paid a small tax.

The constitution of the Republic bears date of Aug. 21, 1911. It vests the executive authority in a President, who is elected for four years by both Houses of the Legislature. The President, who must be at least 35 years of age and who is ineligible for reëlection, is assisted by a cabinet of ministers, whom he appoints and who are responsible to the Chamber of Deputies. The Legislature (Cortes) consists of the Senate and the Chamber of Deputies, or National Council. Senators, 71 members, are elected by municipal councils for six years, 35 (or 36) members being elected every three years. Deputies, 164 in number, are elected by direct male suffrage for three years. Senators must be at least 35 and Deputies at least 25 years of age.

For the purpose of local government Portugal, with the neighboring isles, is divided into 21 districts, corresponding somewhat to the French departments. The districts are again divided into communes (*concelhas*), and these are further subdivided into parishes, about 4000 in number. In each district there are a popularly elected assembly or *junta,* a permanent executive commission chosen from the membership of the junta and charged with the execution of its deliberations, an administrative tribunal for the settlement of administrative controversies, and a Governor charged with the supervision of matters of central administration in the district. The commune is an administrative circumscription whose chief organs of government are an elected municipal council with a president, whose duty it is to execute the resolutions of the council, and an *administrador* charged with the supervision of central affairs in the commune. In each parish there is an elected assembly or junta.

For the administration of justice the country is divided into *comarcas,* or districts, in each of which is provided a court of first instance held by a single judge. There are also in each district a number of justices of the peace, who have jurisdiction in minor civil and criminal cases. Above these are three courts of second instance, located at Lisbon, Oporto, and Ponta Delgada in the Azores, which have original jurisdiction in certain cases and hear appeals from the lower courts, while the ultimate judicial authority is the Supreme Court at Lisbon.

History. What later became Portugal was inhabited in prehistoric times by a branch of the Celtiberian race, made up of the native Iberian stock of the peninsula and the immigrant Celts. Greek colonies were planted at the mouths of the three rivers, the Tagus, the Douro, and the Minho, the name of Lisbon being derived from the ancient Greek Olisipo (city of Ulysses). The Carthaginian influence was weaker in this part of the peninsula than in the eastern. The Roman conquest was begun in 189 B.C. and was gradually completed in the two generations following, though with much difficulty, Viriathus (q.v.), the leader of the Lusitani in their revolt (c.149–139 B.C.), proving a formidable adversary. The Roman province of Lusitania under the Empire contained most of the territory of modern Portugal south of the Douro. In the fifth century Roman control in the peninsula gave way to that of the Visigoths without especially affecting this remote corner. It was included in the area of Mohammedan conquest in the eighth century. In 997 the territory between the Douro and the Minho was taken from the Arab-Moors by Bermudo, King of Galicia, and in 1064 the reconquest was completed as far south as Coimbra by King Ferdinand the Great of Castile, León, and Galicia. The reconquered districts were organized as counties, feudal appanages of Galicia. From the northern county, the Comitatus Portucalensis, extending about the Roman Portus Cale (the modern Oporto), the new nation finally took its name. In the division of Ferdinand's realm

Galicia with Oporto and Coimbra went to his third son, Garcia, but the eldest son, Alfonso VI of León, forcibly united all the family possessions in 1073. The new Mohammedan attack under the Almoravides (q.v.) put Alfonso on the defensive. Among those who came to his assistance was Count Henry of Burgundy, who married Theresa, an illegitimate daughter of Alfonso, and received Coimbra and Oporto, with the title of Count of Portugal (1095). During the internecine wars before and after the death of Alfonso in 1109 the Portuguese began to develop a national spirit and to distinguish themselves from the hitherto dominant Galicians. This was especially true after the death of Count Henry in 1112, when his wife devoted herself to upbuilding an independent kingdom for their infant son. The latter, Alfonso I, assumed the government in 1128, and fought valiantly against the Moors, over whom he won a splendid victory at Ourique in 1139. This was followed by his attempt to found a kingdom and long wars necessitated by the attempts of Castile to subdue his dominions. Alfonso took Lisbon from the Moors in 1147 and made it his capital. He died in 1185, after a long and brilliant reign. His son and successor, Sancho I (1185–1211), gained from the gratitude of a prosperous country the title of the Founder of Towns. Alfonso II (1211–23) did not follow Sancho's wise policy, but came into conflict with the papacy, which culminated in the King's excommunication and an interdict laid upon the Kingdom. His son Sancho II (1223–48) was also excommunicated, the country being put under an interdict, and was deposed by Pope Innocent IV. His brother, Alfonso III (1248–79), was on better terms with the clergy, and also proved to be a capable ruler. He assumed the title of King. The country had now reached its utmost European limits, and its course had been progressive, except for the unfortunate years of struggle with the Church. The long reign of Denis or Diniz (1279–1325), the son of Alfonso III, was a period of progress and development hardly equaled at that time in Europe. Under him Portugal entered on that course of commercial enterprise which was the source of all the country's wealth and greatness. In 1290 he founded the University of Lisbon (transferred to Coimbra in 1308). His son Alfonso IV (1325–57) was compelled to defend his Kingdom against Castilian and Moslem. Alfonso's son Pedro (1357–67) was succeeded by his son Ferdinand (1367–83), the last male in the legitimate line.

On the death of Peter his illegitimate son, John I, took measures to secure the government, and was recognized by the Cortes after some difficulty in 1385. This branch of the Burgundian house is sometimes known as the house of Aviz, the King having been grand master of the Order of Aviz. John's reign of nearly half a century was one of the most noteworthy in Portuguese history. He successfully defended his Kingdom against Castilian attack, and showed himself a statesman and general of uncommon ability. The fame of his reign rests, however, less upon the strong and intelligent administration of the King than upon the work done under the direction of his accomplished son, Prince Henry the Navigator (q.v.), in exploring the African coast with the object of discovering an eastward route to the Indies. In 1420 the Portuguese rediscovered Madeira, and at the close of John's reign they reached the Azores. A successful campaign by Portugal in Morocco, resulting in the capture of Ceuta in 1415, was followed by the acquisition of control over about half of Morocco, which was held until 1578. John I was succeeded by his eldest son, Duarte, or Edward (1433–38), and he by his son Alfonso V (1438–81). The work of Prince Henry's captains and their immediate successors led to the inauguration of a regular system of exploration and the acquisition soon after the middle of the fifteenth century of the Cape Verde Islands and the Guinea coast. Alfonso V interfered in the Castilian succession disputes (1474–76), and was severely defeated at Toro in the latter year. Alfonso was succeeded by his son John II (1481–95), during whose reign Pope Alexander VI issued his famous bull of demarcation (May 4, 1493), giving to Portugal all discoveries east of a meridian 100 leagues west of the Azores and Cape Verde Islands, a decision which was modified by the Treaty of Tordesillas (June 7, 1494) between Portugal and Spain, by which the line of demarcation was moved to a distance 370 leagues west of the Cape Verde Islands. This arrangement presently gave Portugal the important territory of Brazil in the Western Hemisphere. John's successor was his cousin Emmanuel (1495–1521), the son of a younger brother of Alfonso V. His reign was notable for the voyage of Vasco da Gama around the Cape of Good Hope to India (1497–98), opening the period of Portuguese activity in the East, and for the discovery and first settlement of Brazil, which remained for over three centuries an appanage of the Portuguese crown. In 1510 Albuquerque (q.v.) captured Goa, which became the seat of Portuguese power in the East. Within a few years this great commander extended the Portuguese conquests to Malacca and the Sunda Islands. The Portuguese also established themselves at various points on the east coast of Africa, and penetrated into Abyssinia and the Congo country. The reign of Emmanuel's son, John III (1521–57), saw Portugal at the height of its prestige. It ranked as one of the most powerful European monarchies, while Lisbon was one of the most important commercial cities of the Continent.

While Portugal's rise had been rapid, its decline was more sudden still. The numerous wealthy and industrious Jews whose able financial management had done much to establish Portuguese commerce were expelled from the country, while social tyranny and oppression in the colonies as well as at home depressed the energy and crippled the resources of the nation. The death of King John in 1557 made his grandson Sebastian, then a child of three years, King. Drawn by his ambition for new conquests and by the restlessness of the Moors into an African campaign in 1578, the young King met a total defeat and death at Kasr el Kebir (Alcazar Quivir). (This was the beginning of the loss of the Moorish dominions of Portugal. Of the few places remaining in Portuguese control after this unfortunate campaign, Ceuta was garrisoned by Spain in 1580 and ceded to that country in 1668; Saffi was ceded to the Moors in 1641; Tangier to England in 1662; several other places to the Moors in 1689; and the last, Mazagan, in 1770.) The death of Sebastian left but one representative of the old Burgundian line, Sebastian's aged granduncle, the Cardinal Henry, whose brief reign (1578–80) plunged the country still further into misfortunes. His death gave rise to bitter disputes over the succession between several connections of the Portuguese royal house. Of the claimants Philip II of Spain, whose mother was a daughter of the late King Emmanuel, possessed the power and the opportunity to seize the coveted possession, which he promptly did, two battles sufficing for its conquest by the Duke of Alva. The annexation of Portugal to the Spanish monarchy subjected it to the deadly blight of Philip's stately and imposing tyranny; its resources were weakened by the heavy expenses incident to the ruinous wars of Spain; and the Dutch seized most of the Portuguese possessions in the East Indies. In the reign of Philip IV matters were brought to a crisis by the course of his Minister Olivarez, and in 1640 a successful conspiracy of the higher nobility freed Portugal from connection with Spain. This was accomplished under the leadership of John, Duke of Braganza, the descendant of an illegitimate son of John I, but whose rights to the throne came from his being the grandson of that Catharine whose claims to the Portuguese throne in 1581 ought to have given her precedence over Philip II (she being the daughter of Edward, sixth son of King Manoel, and Philip being only the son of Manoel's oldest daughter). The Duke ascended the throne, and the rule of the house of Braganza (which continued until the recent expulsion of young King Manoel, when the Republic was established) began in the person of John IV (1640–56). War with Spain was terminated in 1668, when in the Treaty of Lisbon the independence of Portugal was formally recognized. The succeeding history of Portugal offers little that is of interest. From its high rank as a commercial power the country sank into a position of practical dependence upon England, with which Portugal became closely allied by the Methuen Treaty in 1703. John IV was succeeded by two of his sons, Alfonso VI (1656–67) and Pedro II (1667–1706). To the latter's son, John V (1706–50), succeeded his son, Joseph (1750–77). In this reign the genius and resolution of the Minister Pombal (q.v.) infused temporary vigor into the administration and checked for a time the downward tendency of the national credit. Pombal carried on a relentless war against the nobles and the clergy, and as a result of his efforts the Jesuits were expelled from the country in 1759. The year 1755 was notable for an earthquake which nearly destroyed Lisbon (q.v.). There was a speedy relapse into reaction upon the accession of Joseph's daughter Maria and her husband, Pedro III, who was also her uncle. The latter died in 1786, and three years later, owing to the mental condition of the Queen, the government was put in the care of a regency under the Crown Prince John. Prince John gave evidence of ability and patriotism. Being unable to maintain himself in Portugal against Napoleon, who by the Treaty of Fontainebleau had agreed with Spain upon the partition of Portugal, he left the country in November, 1807, with his family, and transferred his government to Brazil, while a French army under Junot occupied Lisbon. The campaigns of the English and Portuguese forces under Sir Arthur Wellesley freed Portugal of its French invaders (see PENINSULAR WAR), and in 1816, upon the death of his mother, Prince John succeeded to the crowns of Portugal and Brazil as John VI. He continued to reside, however, at the Brazilian capital until 1821.

Portugal had for several generations been under an absolute form of government, the controlling springs of which were the court and the priesthood. The transfer of the seat of government to Brazil was a humiliation to the Portuguese, and aroused a spirit of discontent which made them especially susceptible to the revolutionary influences then alive in Europe. In 1820 the army took the lead in a revolution designed to bring in a constitutional government. King John returned to Portugal, leaving his son Dom Pedro as Regent in Brazil, with instructions to retain that country for the house of Braganza, even at the cost of separation from Portugal. The revolutionists at home insisted upon subordinating Brazil in the new arrangements, and produced a revolt in the latter country. This movement Dom Pedro, loyal to the interests of Brazil, headed, and in 1822 Brazil asserted its independence and the Prince Regent declared himself constitutional Emperor. Meanwhile in Portugal the Brazilian movement caused a reactionary revolt towards absolutism, headed by the King's younger son, Miguel (q.v.), who had been invested with the command of the army. The revolt was put down with British assistance in 1824. Upon the death of King John in 1826 his son, Pedro, Emperor of Brazil, who succeeded to the crown of Portugal, promulgated a constitution, providing for a bicameral Legislature, with an hereditary House of Peers and an elective House of Deputies, its legislative powers being subject to the King's sanction. The fundamental liberties of citizens were guaranteed, and other religions than the Catholic were to be tolerated. Pedro then resigned his right to the crown in favor of his seven-year-old daughter, Maria da Gloria, who, when of age, was to marry her uncle, Miguel. The latter was made Regent in July, 1827, and in this Pedro, who was an unselfish patriot, and not a politician, made his great mistake. The Regent at once took measures in defiance of the constitution to restore the ancient forms of government. He proclaimed himself King in 1828 and sought to reconcile the interests of the conflicting political parties and at the same time place the monarchy on its old basis. In this he was supported by the Absolutists, recruited from the army and the clergy. In 1832 Dom Pedro, who in the preceding year had been forced to abdicate the throne of Brazil, proceeded to uphold the rights of his daughter by force of arms. He placed himself at the head of an expeditionary force, which had been collected by the opponents of Dom Miguel at the island of Terceira, Azores, and in July he was welcomed as a deliverer at Oporto, the Liberal stronghold. A stubborn struggle ensued. In July, 1833, the fleet of Dom Pedro, commanded by Sir Charles Napier, vanquished the Miguelist fleet off Cape St. Vincent, and a few weeks later Lisbon capitulated to Dom Pedro, who proclaimed himself Regent for Dona Maria. Pedro was aided by the intervention of Spanish arms, backed by the influence of the short-lived Quadruple Alliance (England, France, Spain, Portugal). By the agreement of Evora, in 1834, Miguel pledged himself to a renunciation of all claims to the crown and to perpetual exile from the Kingdom. Pedro died Sept. 24, 1834, when Queen Maria was but 15 years of age. Her reign was a troublous one. Neither rulers nor people knew how to carry on a parliamentary government. The fall of Miguel put an end to the Absolutist party, and the political division that took the place of the old was that between Chartists and Liberals, the former upholding the existing constitution, the latter seeking to restore the constitution of 1822, which represented popular sovereignty. The later political history of the country has been that of a series of progressive movements originating in the principal cities and combated, usually with success, by the conservative element. A military revolt in September, 1836, forced the Queen to restore the constitution of 1822, and gave their name to the Septembrists, who thereupon formed the constitution of 1838, modeled upon that of 1822. Another military revolt restored the Chartists to power in 1842, and they governed the country under the leadership of Costa Cabral (q.v.) until in 1852 a new party known as the Regenerators, composed of Septembrists and Chartist seceders, came into power under Saldanha and established direct suffrage. The Queen died Nov. 15, 1853, leaving her husband, Prince Ferdinand of Coburg, as Regent during the minority of their son, Pedro V. The latter died Nov. 11, 1861, having refused to flee from the cholera-stricken city of Lisbon. Ferdinand continued as Regent for the next heir, Luiz (1861–89). The autocratic methods of Saldanha split his party, and finally resulted in 1877 in constituting the Progressist party out of the more radical members of the old Liberal parties. King Luiz died Oct. 9, 1889, and was succeeded by his elder son, Carlos.

The reign of King Carlos was marked by extravagance and by general demoralization of the finances of the country. A practical dictatorship was established under the Premier, Dom J. F. C. Franco, in 1907. On Feb. 1, 1908, the King and his son, the Crown Prince, were assassinated in Lisbon, and the second son, Prince Manoel, became King, as Manoel II. Under this young ruler conditions did not improve, and on Oct. 5, 1910, as the result of a revolution, Manoel II was deposed and a republic was proclaimed, under the provisional presidency of Theophilo Braga. Manoel fled to England. The country was organized under a republican form of government, and in September, 1911, Dr. Manoel Arriaga was elected the first constitutional President. Since that date the country has frequently been rent by ministerial crises. In the Great War which began in Europe in 1914 Portugal decided to comply with her treaty obligations to support England, a declaration to that effect being made soon after the outbreak of war. This made it necessary substantially to reënforce her colonial army in Africa for possible operations against the German colonial forces. See WAR IN EUROPE.

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PORTUGAL, pōr′tōō-gäl′, MARCOS ANTONIO (1762–1830). A Portuguese composer, born in Lisbon. His real name was Da Fonseca. He was educated at the Priests' Seminary in his native town and continued his musical education under the opera singer Borselli, by whose influence he was appointed cembalist at the Madrid Opera in 1782. In 1787 he went to Italy, where, the following year, his first opera, *L' eroe cinese*, was produced. The slight success of his first work was compensated for by the popular favor accorded to *La bacchetta portentosa*, in 1788, at Genoa. In 1790 appeared *Il Molinaro* and *L' astuto*, both in Italy, and he was appointed court conductor at Lisbon, but later returned to Italy. From 1799 to 1810 he conducted at the San Carlos Theatre in Lisbon and produced a number of Italian and Portuguese operas. In 1810 he went to Rio de Janeiro, at which place he occupied the position of general musical director. In 1813, with his brother, Simão, he was appointed joint musical director of the conservatory at Vera Cruz. In 1815 he visited Italy for the last time. He spent the remaining years of his life at Rio de Janeiro as an invalid. He wrote 40 Italian and Portuguese operas, five masses, and much sacred music.

PORTUGALETE, pōr′tōō-gä-lȧ′tȧ. A Spanish seaport near Bilbao (q.v.).

POR′TUGUESE-BRAZILIAN LITERATURE. The literature of Brazil has followed to some degree the literary tendencies of the motherland in Europe. As it was long the custom to send Brazilian youths of promise to Coimbra for their training, the intellectual relations between Portugal and Brazil were very close during the colonial period. Since the winning of Brazilian independence, however, Brazilian writers have shown no slight originality.

Four periods may be marked: 1. From the age of discovery and exploration down to the middle of the eighteenth century, a period during which the seeds of culture are sown by missionaries from Europe, especially by the Jesuits. At first Portuguese and Spanish models are followed servilely, but in the first half of the eighteenth century a slight tendency towards independence manifested itself, even though Portuguese influence still ruled supreme. 2. The second half of the eighteenth century, an age which is characterized by the endeavors of the poets of the school of Minas-Geraes, who show in certain instances a growing desire to escape from the too rigid influence of the Old World. 3. The period ranging from the beginning of the nineteenth century to about 1840, and bearing the impress of the political independence that began in 1822. 4. The epoch dating from 1840, during which the Romantic movement comes to shake the power of pseudo-classicism as well in America as in Europe, and the feeling of national consciousness exerts a constantly growing influence.

1. From the settlement to the middle of the eighteenth century. The Jesuits sought as soon as possible to naturalize the literary forms popular in the old country and composed and had performed dramas religious in their nature and based on the *Autos* of Gil Vicente and his successors. Brazilians usually consider as their first author the Jesuit José de Anchieta (1533–97), a polyglot writer, whose works were composed in Spanish, Tupi, Latin, and Portuguese. Then came the poet Bento Teixeira Pinto (born about 1550). He was long credited with the authorship of the *Relação do naufragio que fez o mesmo Jorge Coelho vindo de Pernambuco a Náo Santo Antonio em o anno de 1565*, but this assignment can no longer be made. More important than Teixeira Pinto are the brothers Gregorio and Eusebio de Mattos. Gregorio (1623–96), the better of the two, was an inveterate satirist; he imitated closely the Spanish Juvenal, Quevedo, adopting also the methods of the Spaniards Lope de Vega and Góngora, and yet the entire movement of Brazilian literature in the seventeenth century revolves about him. Spanish Gongorism prevailed likewise in the lyrics of Bernardo Vieira Ravasco (1617–97) and Manoel Botelho de Oliveira (1636–1711); and Oliveira, like so many Portuguese of the period, wrote at least as much in Spanish as in Portuguese. Bahía, where the Viceroy dwelt, saw the greatest literary development in this first period. It was the centre of societies of men of letters, such as the Academia Brazilica dos Esquecidos (1724), whose members produced much occasional verse of a panegyrical nature. The panegyrics of João Brito de Lima (1671–1742) are typical compositions. We may mention the Franciscan Manoel de Santa Maria Itaparica (born 1704), whose poetical legend, *Eustachidos*, treats the well-known story of St. Eustace, and the *Historia da America portugueza* of Sebastião da Rocha Pitta (1660–1738). This is almost an historical novel, filled with descriptions and digressions, rather than a truly scientific and detailed account of the history of Brazil. The first distinguished dramatist of Brazilian birth now appeared in Antonio José da Silva (1705–?) (q.v.).

2. Second half of the eighteenth century. The influence of Portuguese literature, itself now wholly subordinated to the precepts of French pseudo-classicism, continued to hold sway during this period, but the note of protest against what was fast beginning to be felt as foreign domination rang out ever more loudly both in politics and in letters. On the model of the European academies and arcadias, Rio de Janeiro had the *Academia dos Felizes* (1736), and later the most celebrated of them all, the Arcadia Ultramarina, founded by the poet José Basilio da Gama (1740–85) and kindred spirits, at a date that is not known with certainty (c.1780 or 1783). The members of the coterie of Minas Geraes, many of them associated with the Arcadia Ultramarina, known as the *poetas mineiros* (who represent the best of the lyric and epic poetry of Brazil's colonial period), headed the luckless movement for political independence which emanated from that region. To José Basilio, a master of style and harmony, is due the epic *O Uraguay* (1769), which describes the struggles of the Spanish and Portuguese troops against the Indians of Paraguay. Another worthy endeavor to compose an epic is seen in the *Caramurú* (1781), of José de Santa Rita Durão (1737–84), which gives a résumé of Brazilian history during the three centuries of its colonial existence. By many it is considered the most thoroughly Brazilian piece that has appeared so far. The earliest of the lyric poets of the Minas Geraes group was Claudio Manoel da Costa (1729–90), who hanged himself in prison after the failure of the revolutionary plot in which he and his fellow poets had figured. His close friend Thomaz Antonio Gonzaga (1744–1807), the greatest member of the school and one of the most popular poets in the Portuguese speech, perished in exile. Gonzaga is best known by the pseudonym of Dirceu, which he assumed in his famous *Marilia de Dirceu.* This collection of impassioned lyrics is addressed to his beloved (Marilia). The erotic spirit also inspires the lyrics in the *Glaura* (1801) of Manoel Ignacio da Silva Alvarenga (1749–1814), who helped to found the Arcadia Ultramarina. Silva Alvarenga earnestly endeavored to infuse a more national and popular spirit into the Brazilian lyric. Domingos Caldas Barbosa (1740–1800), author of *cantigas, quintilhas,* sonnets, etc., and Francesco de Mello Franco (1757–1823), who, with the aid of José Bonifacio, wrote the mock-heroic poem, *O reino da estupidez,* belong more properly to Portugal. Bento de Figueiredo Tenreiro Aranha (1769–1811) imitated Horace in his odes.

3. From about 1800 to about 1840. The fetters of classicism were now shaken off by certain writers who advocated a wider use of Christian elements in poetic composition. Among them were Antonio Pereira de Souza Caldas (1762–

1814), known for his verse translation of the Psalms, etc.; Frei Francisco de São Carlos (1768–1829), author of the excellent epic, *A Assumpção da Santissima Virgem;* and José Eloy Ottoni (1764–1851), who made metrical versions of the Book of Job and of Proverbs. Although their enduring fame is rather that of statesmen and scientists, José Bonifacio de Andrada e Silva (1765–1838; patriotic and political odes, etc.), Francisco Vilella Barbosa, Marquis of Paranaguá (1769–1846; love lyrics), and Domingos Borges de Barros, Viscount da Pedra Branca (1783–1855) deserve to be mentioned here. Mythology and poetical metamorphosing mark the verse of Januario da Cunha Barbosa (1780–1846; poem *O Nictheroy*), who edited the *Parnaso brasileiro,* the first important anthology of Brazilian verse. Noteworthy prose was written by the eloquent Franciscan preacher Francisco de Mont' Alverne, whose family name was De Carvalho (1784–1858). The *Maximas, pensamentos e reflexões* of Marianno José Pereira da Fonseca, Marquis of Maricá (1773–1848), and the *Diccionario da lingua portugueza* (1789) and the *Epitome da grammatica portugueza* (1802) of Antonio de Moraes Silva (1755–1824) are important.

4. Since 1840. With an enlightened monarch like Dom Pedro II in power, letters and science grew stronger; the Emperor himself was a scientist of no mean ability, and he was a munificent patron of authors. The Romantic movement came to arouse the Brazilians to a still higher estimate of the part that the emancipated individual can play in the creation of a noble native literature. The triumph of the Romantic ideas and the consciousness of national independence are signally marked in all the poetry of Domingos José Gonçalves de Magalhães, Viscount of Araguaya (1811–82). His beautiful lyrics, mostly elegiac in tone, may be judged by those contained in the collections entitled *Suspiros poeticos e Saudades* and *Urania;* the poem *Napoleão em Waterloo* is deemed the best of all. Magalhães succeeds even better in his epic, for his *Confederação dos Tamayos,* celebrating in unrhymed hendecasyllable the struggles of certain Indian tribes against the Portuguese invaders, is imperishable. His dramas, such as the *Anton José* and the *Olgiato,* are not so good. Of his scientific or philosophical prose there may be noted the *Factos do espirito humano.*

Manoel de Araujo Porto-Alegre, Baron of Santo Angelo (1806–79), skilled in painting and architecture, cultivated belles-lettres also, and, besides composing several comedies, he enriched Brazilian literature with the idyllic and descriptive *Brasilianas* and the epic *Colombo.* Inspired by the *Brasilianas,* Antonio Gonçalves Dias (1823–64) put forth three volumes of lyrics, viz., *Primeiros cantos, Segundos cantos e sextilhas de Fr. Antão,* and *Ultimos cantos,* as well as an epic, *Os Tymbiras,* and several tragedies (*Leonor de Mendonça, Boabdil, Beatrice Cenci, etc.*). With Manoel de Araujo Porto-Alegre and Joaquim Manoel de Macedo (1820–82) he founded the influential literary review *Guanagara.* Macedo, favorably known for his novels (*Moreninha, etc.*), tragedies (*O Cégo, Cobé, etc.*), and vaudevilles, wrote the excellent lyrical and descriptive poem *A Nebulosa.* Odorico Mendes (1799–1864) is esteemed for his verse translations of Homer and Vergil (*Iliada, Odysse, Eneida, Georgicas*); in his original poems pedantry obscures his merits. Romantic tenets have generally been followed by Joaquim Norberto de Souza Silva (1820–91), an indefatigable writer (lyrical *Modulações poeticas,* epico-lyric *Balatas, Cantos epicos,* tales, and a prose *Bosquejo da historia da poesia brasileira* which prefaces his *Modulações*); by Antonio Gonçalves Texeira e Souza (1812–61: *Canticos lyricos,* the idyllic and allegorical *Tres dias de um noivado,* and such novels as *O filtho do pescador, A Providencia, Maria, etc.*); by Joaquim José Teixeira (apologues); by Pedro de Calasans; and by Bernardo Joaquim da Silva Guimarães (1827–85). The *Historia geral do Brasil* of Francisco Adolpho de Varnhagen (1816–78) shows talent.

Of more recent times we can hardly speak as yet with sufficient critical retrospect. As everywhere else, so in Brazil Romantic doctrines have been swept away by a Realistic movement. The change from an imperial to a republican form of government has also very naturally left its impress upon current literary production. Foremost among the writers of the last three decades of the nineteenth century stands Sylvio Romero, a lyric poet (*Cantos do fim do seculo, Ultimos harpejos*) and the author of critical works on ethnography, literary history, and philosophy. Out of many other forceful writers, only the lyric poet Olavo Bilac and the novelists Verissimo, Alencar, and Taunay need be cited here.

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PORTUGUESE EAST AFRICA, or MOZAMBIQUE. A colonial possession of Portugal, on the east coast of Africa, bounded by German East Africa on the north, the Indian Ocean (mainly Mozambique Channel) on the east, Zululand on the south, and the Transvaal Province, Rhodesia, the Nyassaland Protectorate, and Lake Nyassa on the west (Map: Africa, H 6). Area, 293,400 square miles. The coast is low and forms but few harbors. In the portion north of the Zambezi the country rises rapidly towards the west, where the Namuli Mountains form the principal mountain range of the colony and rise, in Namuli Peak, to an altitude of nearly 9000 feet. In the south the ascent is more gradual. The chief elevations here are the Manica plateau, with Mount Doe rising to nearly 8000 feet, the Gorangoza plateau, and the Lebombo Mountains. The eastern escarpment of the South African plateau follows the west boundary. The principal rivers are the Rovuma, which forms part of the north boundary of the colony, the Zambezi, the Shire, the Pungwe, the Sabi, and the Limpopo. There are, besides, many small streams along the coast. The climate of the lowland along the coast is hot and humid, malarial fevers being frequent, but inland better conditions prevail. The mean annual temperature at Quilimane, near the coast, is 85° F., ranging from 106° to 49°. The rainy season lasts from December to March.

The vegetation is tropical. The coast region yields coconuts, bananas, and other fruits, indigo, tobacco, coffee, and rubber. Wheat, corn, beans, sugar cane, and rice are also grown to some extent. The country possesses great mineral wealth, including gold, iron, and coal. The gold deposits are found principally in Manica, near the frontier of Rhodesia, and are exploited almost exclusively by British subjects. There are large coal beds near Tete and Delagoa Bay. Iron is extracted to some extent by the Makua. The exploitation of the mineral resources of the country as well as its entire economic development is greatly obstructed by the lack of transportation facilities and the unfavorable climatic conditions, which prevent an extensive European immigration. The Mozambique Company, organized largely with British capital, secured a royal charter for the administration of the Manica and Sofala regions for a period of 50 years beginning with 1891. The Nyassa Company controls the region between the Rovuma, Lake Nyassa, and the Lurio.

The imports of the colony amounted in 1913 to 12,678,000 escudos; exports, 5,346,000; re-exports, 8,935,000; transit, 34,044,000. The imports are mainly cotton goods, iron products, and beverages. The principal exports are rubber, wax, ivory, and minerals. Most of the trade passes through the ports of Lourenço Marques, Beira, and Mozambique. The Delagoa Bay Railway, 57 miles in the colony, connects Lourenço Marques with Pretoria, in the Transvaal. The Beira Railway extends from Beira 204 miles to the Mashonaland border, whence the line continues to Salisbury. The Gaza line from Chai-Chai to Manjacase has 32 miles in operation, and that from Mutamba to Inharrime 25 miles. Construction has been begun on a line from Lourenço Marques to the Swaziland border. A line is projected from Beira northward to Port Herold in Nyassaland. There is navigation on the Zambezi and Shire rivers. The colony, which is under a governor-general, comprises territories administered directly and others administered by the Nyassa and Mozambique companies. There are a government council (since 1907) and a provincial council. The capital is Lourenço Marques, with about 10,000 inhabitants, nearly half European. The budget for 1913–14 balanced at 5,878,598 escudos.

The population is estimated at 3,120,000, nine-tenths of whom belong to the Bantu race. The principal tribes are the Makua and Yao in the north, both Bantu; the Tavala in the central part; and the Vatwa, a Zulu tribe, and the Tonga, a tribe of mixed origin, in the south. The occupation of the east coast of Africa by the Portuguese dates from 1498, when Vasco da Gama landed at one of the mouths of the Zambezi. A number of settlements were founded along the coast during the first decade of the sixteenth century, and the military post of Tete, on the Zambezi, was founded in 1632. Slavery was abolished in 1878. The boundaries of the colony were fixed by agreements with Great Britain in 1891 and with Germany in 1886 and 1890. Consult: Andrade Corvo, *Estudos sobre as provincias ultramarinas* (4 vols., Lisbon, 1883–87); J. P. de Oliveira Martins, *Portugal em Africa* (Oporto, 1891); A. d'Almada Negreiros, *Le Mozambique* (Paris, 1904); G. M'C. Theal, *History and Ethnography of Africa South of the Zambezi* (3 vols., London, 1907–10).

PORTUGUESE GUINEA, gĭn′ē. A colony of Portugal in west Africa, bounded on the north by Senegal, on the east and south by French Guinea, on the west by the Atlantic (Map: Africa, C 3). The area is estimated at about 14,000 square miles. Numerous islands belonging to the colony, including the Bissagos, line the coast. The shores are deeply indented by estuaries, but difficult of navigation on account of strong currents and shifting channels. The land rises gradually from the flat coast region to the mountains of French Guinea and is generally fertile. The Rio Grande, or Comba, which rises in Futa Jallon, is the largest river. In the lower part of its course it forms a wide inlet of the sea. The climate is unhealthful and excessively hot. The average annual temperature is 78.8° F. The rainy season is between May and November. The flora and fauna are tropical, and the palm tree abounds. The forests contain a large variety of valuable woods. Rice and millet are the chief crops.

The French control the commerce. Bulama, the capital, on the island of the same name, has a safe harbor and shares the commerce with two other ports, Bissão and Cacheo. Imports and exports, in 1908, 857,000 and 492,000 escudos respectively; in 1911, 1,520,000 and 940,000. Ivory, groundnuts, wax, and rubber are exported. The colony is administered by a governor, but Portuguese authority is little felt beyond the trading centres, and the coast tribes are virtually uninfluenced by either Christian or Mohammedan culture. The natives of the interior are mostly Mandingo and Fulah, both Mohammedan. The number of the people is variously estimated, one of the most recent figures being 820,000. The military force is very small. The budget for 1913–14 balanced at 743,885 escudos. Portuguese Guinea was a subject of contention between Portugal and Great Britain between 1792 and 1870; in the latter year President U. S. Grant as arbitrator disallowed the British claims.

PORTUGUESE INDIA. See DAMAN; DIU; GOA; INDIA, PORTUGUESE.

PORTUGUESE LANGUAGE. One of the Romance, or Latin, languages, as to-day spoken in Portugal, Brazil, the Spanish Province of Galicia (with archaic and dialectal elements), the Cape Verde Islands, Portuguese Guinea, and other Portuguese colonies. As in the case of the sister languages, Spanish, French, Italian, etc., Portuguese is the direct modern form of the popular Latin of the Roman soldiery and colonists rather than of classic speech of Rome. In its form it resembles the Spanish, its nearest neighbor, more than it does any one of the other Romance tongues. Its literature is much less important than that of the French, Spanish, or Italian, because it has been too largely imitative and too frequently subordinated to influences from France and Spain, and only exceptionally original in tone and content. Even the Portuguese vocabulary betrays considerable borrowing from France.

According to the best estimate there seem to be 11 vowel sounds, at least, viz., three values of *a*, one long and open, like the *a* of *father*, a second less open and colored, with a short *o* sound, like the *a* of *malt*, and a third, slurred and indistinct in nature, but akin to the *a* of *around;* three *e* sounds, one close, another open, and a third (written *e* or *i*) indistinct in value and not unlike the French so-called mute *e* or the sound of *u* in *fur;* two *i*'s, one like the *i* of *bit* and the other like the *i* of *ravine*, this latter value being represented by the vocalic *y* and by *e*, as well as by *i;* two *o* sounds, an open and a close; and a *u* sound (denoted by *u* and *o*), approximate to the *u* of *flute*. These are all oral vowels. Nasalized forms of five vowels occur also, viz., a nasalized *a* (written *ã*, *an*, or *am*), a nasalized close *ē* (written *em* or *en*), a nasalized *i* (written *im* or *in*), a nasalized closed *o* (written *õ*, *om*, *on*), and a nasalized *u* (written *um* or *un*). Portuguese has a number of diphthongs. Several of these latter may also be nasalized; but the process of nasalization is not so complete in the case of either the vowels or the diphthongs as it is in French, for some trace of the nasalizing consonant (*m*, *n*) seems to persist (with a velar quality). The investigations of expert phoneticians like Vianna show the existence of no fewer than 26 consonantal sounds in the language. These are: *p*, *b*, a bilabial *b*, *f*, *v*, *w* (denoted by *u* or *o* in hiatus); *m*, *t*, *d*, a spirant *d* (*d* pronounced like *th* in *the*), *l*, a palatalized *l* (written *lh* and pronounced approximately like the *li* of *filial*), a guttural *l*, *n*, a palatalized *n* (written *nh* and pronounced not unlike the *ni* of *onion*), a velar *n* (i.e., the *ng* sound which ordinarily follows a preceding nasalized vowel); tongue-trilled *r* and *rr* (written *r*, *rr*, and *rh*), the latter a reënforced form of the former and both carefully pronounced; the sibilants *s* (having the value of the English *ss* and written *s*, *ss*, *c* before *e* or *i*, *ç* before other vowels and occasionally *x*), *z* (pronounced like the English *z* and written *s* or *z*), *š* (the phonetic notation for the English *sh* sound, represented in Portuguese by *ch*, *x*, *s*, *z*), and *ž* (the phonetic notation for the sibilant sound heard in the English *azure* and represented in Portuguese by *j*, *g*, before *e* or *i*, *s*, and *z*); *y* (i.e., *i* or *e* with a consonantal value easily acquired in hiatus); *k* (the English *k* sound, denoted in Portuguese by *c* before *a*, *o*, *u*, by *q* before *ua*, by *qu* before *e* or *i*, by *ch* in a few learned words, and by *k* in some foreign words); and finally *g* (i.e., the sound in the English *go*, denoted by *g* before *a*, *o*, or *u* and by *gu* before *e* or *i*). Of the consonants *d*, *t*, *n*, *l* it should be remarked that their dental character is more pronounced than in English, as in the formation of them the tongue tends to touch the base of the upper teeth. The linking together in utterance of syntactically related words in a sentence accounts for the variations in value of certain consonants; it does so particularly in the case of the sibilants *s* and *z*. One of the most marked features of the Portuguese as compared with other Romance languages is the loss of intervocalic *l* and *n;* thus, *quaes* represents the Latin *quales* and *pessoa* the Latin *persona*. The forms of the article *o*, *a*, "the," are due to the intervocalic position of the *l* in such syntactical combinations as *de-lo*, *de-la*, "of the," whence have resulted the forms *do* and *da*, and by a redivision of the compound *d'o* and *d'a*. In common with Spanish, but probably to a greater degree, Portuguese shows an interchange of *l*, *r*, and *n*. A metathesis of vowels, consonants, and even whole syllables of the Latin etymon is not infrequent in the language. As a result of linking or sentence phonetics, contiguous vowels of different words in a sentence are often pronounced in a single syllable; thus, *toda a armada* becomes in rapid speech *todarmada*.

In its grammar Portuguese rather closely parallels Spanish. A great body of the substantives has the distinctive endings of *a* for feminines and *o* for masculines, corresponding to the Latin first and second declensions. There are traces of the survival of the Latin nominative case (*Deos*, *Domingos*, etc.), but the accusative is in general the norm of the Portuguese form. The sign of the plural is regularly *s*. As in Spanish the regular verbs of the *-ĕre* conjugation have joined either the conjugation in *-ēre* or that in *-ire*. An extremely interesting phenomenon is the appearance of a personal or inflected infinitive, which makes possible a very succinct construction, comparable to the Latin accusative and infinitive. *Partir*, for example, may be conjugated: *partir eu*, I to depart; *partires tu*, thou to depart; *partir elle*, he to depart; *partirmos nós*, we to depart; *partirdes vos*, you to depart; *partirem elles*, they to depart; and "it is time for us to depart" may be rendered *tempo é de partirmos*. The earliest written specimens of Portuguese appear to be certain documents of 1192.

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PORTUGUESE LITERATURE. The literature of Portugal was one of the latest to arrive at a consciousness of national unity and independence and therefore one of the latest to begin to achieve a literary history. Furthermore, as a result of the somewhat sluggish and unassertive temperament of the people as a whole, Portuguese literature has been less independent than that of the sister tongues, and has been only too ready to limit itself to imitation of what had arisen within the bounds of northern France, Provence, Italy, and especially of the near neighbor Spain. The lyric spirit, with decided tendencies towards the idyllic and the bucolic, has ever predominated in Portugal. It was so at the very outset, for, whereas lyric verse followed in the wake of epic verse in Spain and in France, it appeared at the very beginning of literary activity in Portugal, and the epic appeared there only three centuries and a half later, and then as the result of a consciously artistic development. And the love lyric, from which we date the rise of Portuguese literature, was not of spontaneous growth or native to the soil; on the contrary, it was an exotic that had thriven in France before it was transplanted to the more westerly land.

According to the scheme adopted by Theophilo Braga and by C. M. de Vasconcellos, six main periods may be distinguished in the course of Portuguese literary history.

1. In the first period (1200 to 1385) the impulse to literary production came from France. The first Portuguese dynasty was founded by Burgundian nobles, in whose train there entered into the land, with their French habits and predilections, soldiers and colonists who settled on the territory regained from the Arabs during the age of the reconquest. Moreover, the constant pilgrimages to the shrine of St. James at Compostella, ecclesiastical relations of various kinds, and royal and noble intermarriages made the relations between France and Portugal exceedingly close. The troubadours early penetrated the western territory, and met with particular favor in Galicia, a district linguistically connected with Portugal. Their strains were soon taken and reëchoed by native poets, who imitated as well as they might the love lyric, the panegyric, the satire, the debate, and the other conventional poetical forms of Provence. The flourishing period of composition in Provençal measures and according to Provençal ideals began with the reign of Affonso III (1246–79), and its high-water mark was reached in the reign of his successor, King Diniz (1279–1325), the greatest of all the native troubadours, whose poetical gifts were inherited by his natural sons, Affonso Sanches and Pedro, Count of Barcellos. Of these poets and about 200 others of this period nearly 2000 poems are preserved, nearly 140 of which are from the pen of the monarch himself, not a few of them being ascribed to courtiers such as the Chancellor Estevam da Guarda and the Admiral Gomes Charinho. We find the great body of this verse in certain *cancioneiros,* or song books, one set of which contains the Galician lyrics of the Castilian monarch Alfonso the Wise; three of them—the Cancioneiro da Ajuda and the Cancioneiro da Vaticana, so named from the libraries in which they are deposited, and the Cancioneiro Colocci-Brancuti, bearing the name of its present and also its former owners—have the poems of native Portuguese authors. Although the prevailing tone in the Galician-Portuguese literature of this age is that of the artificial Provençal lyric, there is a noticeable tendency to take up and adapt popular forms of a kind that still live in the oral tradition of Portugal and of northern and western Spain.

Prose composition at this time consists chiefly of genealogies (such as the *Livro das Linhagens* of the Count of Barcellos, 1289–1354) and translations from Latin—lives of saints, visions of the other world, etc.—and of translations and imitations of material borrowed from northern France and already well known in Spain, such as the Charlemagne and the Arthurian stories (cf. the *Cavalleiros da Mesa Redonda,* one of the few of them that have thus far been published) and those dealing with the quest of the Holy Grail. It has been asserted that original composition of chivalrous romances began in Portugal as early as the fourteenth century; for some persons think that the *Amadis de Gaula,* of which the earliest form preserved is a Spanish version, was written originally in Portuguese at this time and was taken thence by Spanish translators and elaborators. (See SPANISH LITERATURE.) Historical writing is represented by the appearance of chronicles dealing with religious matters or with military undertakings (*Chronica da conquista do Algarve*) and things of political import.

2. The second period continues from 1385 to 1521. The time is really one of transition, and shows by the increased interest taken in the works of classic antiquity the influence of the all-pervading Renaissance movement. The best spirits begin to turn away from Provençal ideals and, in imitation of the course pursued by the chief Spanish writers, to adopt not infrequently a more serious didactic tone, which is borne out by use of the Dantesque allegory.

The bulk of the poetry of the age was produced by the *poetas palacianos* of the courts of João II (1481–95) and Emmanuel the Great (1495–1521). García de Resende, one of these poets, played a part similar to that performed by Baena at the court of Castile, by collecting and publishing at Lisbon in 1516 the verse of the numerous *poetas palacianos.* Four of the authors represented in this *Cancioneiro Geral* of García de Resende merit particular mention. They are Gil Vicente (c.1470–c.1540), who is more remarkable, however, for the development which he gave to the drama; Christovam Falcão (c.1512–1550 or 1557), whose works are by some students attributed in their entirety to Bernardim Ribeiro, and whose idyll *Crisfal,* the first composition of this favorite kind in Portuguese, is said to record his own love experiences; Bernardim Ribeiro (?1486–1552), the author of eclogues and of the famous *Saudades,* a work which with its pastoral and sentimental tendencies furnished the foundation of all such later productions in the land (the exact dates of Falcão and Ribeiro are very uncertain); and Sâ de Miranda (1495–1558), who, although he utilizes still the older poetical forms, infuses them with a new spirit and appreciates fully, as did to a considerable degree Falcão and Ribeiro, the value of the popular pastoral exemplified by the *serranilha* and similar compositions.

In prose the most important original works are didactic or historical in their nature and there is some translation of the Latin moralists and historians. At the request of his Queen, Dona Leonor, King Duarte between 1428 and 1438 composed a treatise on statecraft, entitled *O leal conselheiro*, and the Infante Dom Pedro gave expression to the experiences of an active and observant life in his *Virtuosa bemfcitoria.* The founder of true history writing appears in the person of Fernâo Lopes (born c.1380), who compiled the *Chronica de Dom Fernando*, the *Chronica de Dom Pedro*, and especially the *Chronica del Rey Dom Johann de boa memoria.* Further historical accounts were provided by Gomes Eannes de Azurara, who described the conquest in Africa, by Ruy de Pina (*Chronica do Senhor Rey D. Duarte*), and by João Alvares (*Chronica do sancto Iffante Dom Fernando*).

3 and 4. The two periods that come next and embrace the long stretch between 1521 and 1700 may conveniently be regarded as forming one continuous period, an age of glory in its first part and one of decadence and stylistic exaggeration in its second. The path that Portuguese literature was now to take was indicated by Sâ de Miranda, who returned in 1526 from his sojourn in Italy imbued with a love for Italian humanism. Before the visit to Italy Miranda had given new life and enduring consistency to the pastoral; now, along with the sonnet, the hendecasyllable, the octave, the *terza rima,* and other Italian lyric and narrative verse forms, he introduced elements of the highly refined Italian pastoral; and, furthermore, under the influence of Bibbiena and Ariosto, he produced two prose dramas, the *Estrangeiros* (c.1527) and the *Vilhalpandos*, which necessarily, like their Italian originals, derive from the drama of Plautus and Terence. It cannot be said that the plays of Sâ de Miranda had any widespread popularity; but they indicated the way for his disciple Jorge Ferreira de Vasconcellos (died 1585), who wrote moralities on the model of *La Celestina.* Another of the pupils of Sâ de Miranda was Antonio Ferreira, who chose a national subject and in his *Ines de Castro* (1558) gave Portugal her first classic tragedy, just as in his play *O cioso* he gave modern Europe one of its earliest character comedies. The Italian lyric measures imported by Sâ de Miranda were adopted by many disciples (the *Quinhentistas*), who modeled themselves on the singer of Madonna Laura. A thoroughly popular drama was that developed by Gil Vicente (c.1470–c.1540). He derived his inspiration from the Spanish playwright Juan del Encina, but he sought his subjects on all sides, and developed them with great originality of treatment and in a wholly national spirit. A third figure of this period rendered illustrious by Sâ de Miranda and Gil Vicente is the most famous of all Portuguese poets, Luiz de Camões (c.1524–80). Like those two authors he aspired to dramatic honors, and in three early comedies (*Filodemo, Rei Seleuco,* and *Enfatriões*) he showed himself to be an ingenious playwright. His fame, nevertheless, rests rather upon his lyric and epic achievements. The fiery passion and sentiments of the man and lover find expression in his various lyrics. The personal note rings out also in his glorious epic *Os Lusiadas,* filled with the spirit of national consciousness and patriotic fervor excited by a realization of the large part that Portugal had played in geographical discovery and in the conquest of territory in the distant Indies.

In the second part (1580–1700) of this long period the number of writers is legion, but the great majority of them lacked originality and force. Many *Camonistas,* or disciples of Camões, essay the epic, e.g., Francisco de Andrade, *Primeiro cerco de Diu* (1589); Sâ de Menezes, *Malacca conquistada;* Pereira Brandão, *Elegiada* (1588), commemorating the disastrous campaign of Dom Sebastian; Quevedo e Castellobranco, *Affonso Africano* (1611); Pereira de Castro, *Ulyssea* (1636); but none rise above mediocrity. The sadness and gloom resultant upon subordination to Spanish rule were not favorable to the composition of eminent or stirring epics. The tightening of the political bonds to Spain superinduced an even larger degree of servility to Castilian literary fashions, and Gongorism with its formal excesses, its bombast, its studied obscurity of style, and its strained conceits, invaded Portugal. Among the lyric poets of the time are Rodrigues de Castro, Lobo Soropita, Frei Bernardo de Brito, the nun Violante do Ceo (1601–93), and Manoel de Faria e Sousa; writers of pastoral poems and romances are Francisco Rodrigues Lobo (*Primavera, Pastor peregrino,* and *O desenganado*), Alvares do Oriente (*Lusitania transformada*), and Manoel da Veiga Tagarro. The taint of culteranismo is deplorably clear in the verse contained in the collections entitled *A fenix renascida* and *Ecos que o clarim da fama da.* A natural note is struck in the unaffected lyrics of the historian Manoel de Mello. Spanish *siglo de oro* plays held full sway on the Portuguese stage; but Manoel Coelho Rebello did produce humorous interludes in the home speech.

Composition in prose towards the middle of the sixteenth century was largely concerned with pastoral and chivalrous romances and with tales. The renowned chivalrous romance, *Amadis de Gaula,* so persistently claimed for Portugal by certain historians of her literature, was an exceedingly popular book, and it led to the writing of continuations and imitations of it, as an example of which may be cited the *Palmerim d'Inglaterra* of Moraes (1544). Of the Castilian *Celestina* a somewhat native tradition appears in the tales of Fernandes Trancoso. Unfortunately for Portugal the best pastoral poem of the age, the *Diana* of the Portuguese Jorge de Montemor, was written in Spanish. The sonorous and rhetorical qualities of Portuguese prose were excellently shown by Rodrigues Lobo in his *Corte na aldeia e noites de inverno.* The historians direct their attention particularly to the adventures of Portuguese heroes and arms in the Indies. The romantic side of the expeditions of exploration and conquest is made prominent in the collection termed *Historia tragico-maritima.* Other ambitious efforts are those of Barros in his *Decadas* and Albuquerque the Younger in his story of his father's deeds (*Commentarios*); personal observation guided the records left us by Pinto, by Fernam Lopes de Castanheda, and by Correia. Several chronicles register the noteworthy events of the lives of the monarchs of the period of conquest, and a number of works of a comprehensive nature seek to furnish a general history of the fatherland. Manoel de Mello wrote most of his historical treatises in Spanish; his *Epanaphoras de varia historia portugueza* (1660) is in Portuguese. Pulpit eloquence is most ably represented by the discourses and sermons of the Jesuit Antonio Vieira (1608–97), and Portuguese epistolary style is seen at its best in the *Cartas* of both Vieira and Manoel de Mello.

5. During the period from 1700 to 1825 French classicism ruled supreme in Portugal. Xavier de Meneses promulgated his verse translation of Boileau's *Art poétique,* and sought to apply its precepts in his tedious epic, the *Henriqueida.* The Academia Real Portugueza was founded (1721) in the hope that it would control the literary destinies of the land; but it proved to be powerless, though the coterie of poets banded together in the Arcadia became really influential. The Arcadians were actuated somewhat by the wholesome principle of combining the plastic and correct forms of French classicism with elements derived from domestic models of the sixteenth century, but in the main the native tradition was slighted. Corrêa Garção and Antonio Diniz da Cruz e Silva were Arcadians who preached Horace and Boileau to their compatriots; Antonio Diniz's *Hyssope,* modeled on, but not a mere imitation of, Boileau's *Lutrin,* is the most noted mock heroic in Portuguese. Dramatic production is almost wholly in accordance with French rules. To the second half of the century belong its two most eminent authors, Francisco Manoel do Nascimento (1734–1819), known in the Arcadia by the pseudonym of Filinto Elysio, and Manoel Maria Barbosa du Boccage (1765–1805). Nascimento was a gifted lyric poet, with a refined and pleasing diction, which stood him in good stead also in his prose translation of Osorio's Latin history of Emmanuel the Great. The poetic talent of Boccage, who founded the Nova Arcadia (in which he was styled Elmano), was even more pronounced; no Portuguese poet has surpassed him in the use of the sonnet. Both Nascimento and Boccage had followers. To Boccage's unskillful imitators is due a new form of culteranismo for which the master has been unjustly blamed and to which the term Elmanismo has been improperly applied. A pretentious rival of Camões was José Agostinho de Macedo (1761–1831), who has now lost a good deal of the prestige that he once enjoyed by reason of his epic *O Oriente.*

6. The nineteenth century. The Peninsular War and the fierce struggle against Napoleonic encroachments stirred patriotic feeling in Portugal to greater activity than had been witnessed for several centuries. As everywhere else in Europe modern liberal thought made much headway in the land, and as everywhere else the young exponents of modern scientific ideas came into conflict with the unprogressive government of the country. João Baptista da Silva Leitão, Viscount d'Almeida-Garrett (1799–1854), returned from a period of expatriation spent in England and France, imbued with the Romantic principles which he found fully established in those lands, and with the strong desire to study the past of his own country and to revive its literary traditions. Even while still in exile he composed the noble poem *Camões* (Paris, 1825), replete with patriotic fervor, the satirical poem *Dona Branca,* and the versified novel *Adozinda* (London, 1828), the last named based on Portuguese folk tales. Many-sided in his endeavors, Almeida-Garrett tried unsuccessfully to create anew a national drama, for while his own plays *Un auto de Gil Vicente, O alfageme de Santarem,* and *Philippa de Vilhena,* revived the older traditions of the theatre of Gil Vicente and were successful, he had no successors. His lyric achievements, while less splendid than might have been expected, were none the less of healthful and permanent influence; and his success in the historical novel, which he essayed under the influence of Scott, is worthy of note. Scott was already well known in Portugal, having been translated and even imitated by Alejandre Herculano de Carvalho e Araujo (1810–77), who passed his exile in England. Events and pictures of the reign of João I are presented to us in his *Enrico* and his *Monge de Cister,* and some eight centuries are covered by his *Lendas e narrativas.* A residuum of Romantic feeling along with a more pronounced tendency towards the formal methods of the Arcadians may be perceived in the lyrics of Antonio Feliciano de Castilho (1800–75). His *Ciumes do Bardo* and his *Noite do Castello* have the Romantic tinge; his *Cartas de Echo a Narciso* and later volumes like the *Excavações poeticas* and the *Outono* show stress laid rather upon Arcadian elegance and finish of outward poetical form. In recent times the drama, the historical novel, and the lyric have been cultivated by many followers of the three leading authors mentioned, and at least a moderate degree of success has been attained by Augusto Rebello da Silva (1822–71; historical romances, *A mocidade de Dom Joao V,* etc.), Mendes Leal (1818–86), Silva Gayo, and especially Camillo Castello Branco (1825–90), who has the credit of having created the modern Portuguese novel of manners. An unwholesome sentimentalism prevails in the lyrics of Soares de Passos (1826–60); a romantic tone as well as some of the polish of Castilho's verse can be recognized in the poems of Thomaz Antonio Ribeiro Ferreira (1831–1901), whose verses to Portugal will probably live as long as there are Portuguese.

Although the Romantic doctrines are still professed by a number of Portuguese writers, a not unnatural reaction against the exaggerations of ultraromanticism has set in since 1865 and has found expression in the aims and utterances of writers of the school of Coimbra, an appellation which does not sufficiently indicate the expansion of the new movement. Under the influence of Hegelianism and the positivist doctrines of Comte, this movement has sought to develop a strictly scientific spirit and to apply it to the sober investigation of the mediæval past. An encouraging sign of the success of the reform thus undertaken is the appearance of the poet João de Deus Ramos (1830–96), the author of the lyrics *Flores do campo* (1869), *Ramo de flores,* and *Despedidas de verão.* And this same movement produced the man whose name, after those of João des Deus Ramos and Almeida-Garrett, is best known abroad to-day—Anthero de Quental (1842–92), whose famous sonnets are "as gleaming swords." Equally encouraging is the energy with which scientific investigation and literary study have been undertaken by persons of the ability of Theophilo Braga, Gonçalves Vianna, J. Leite de Vasconcellos, and Francisco Adolpho Coelho.

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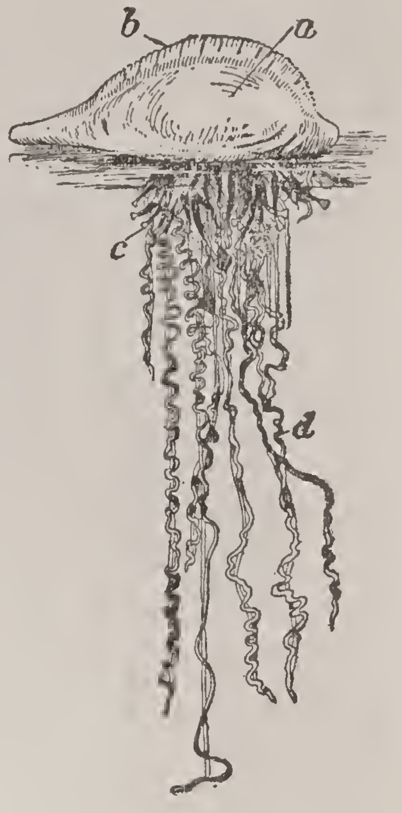
PORTUGUESE MAN-OF-WAR. The popular name of certain remarkable siphonophores (q.v.) of the genus *Physalia*. The pneumatophore or float is an oblong, crested bladder, flattened on the lower side, from which are freely pendent the various individuals of the colony. The most notable of these are the long capturing filaments, which are extraordinarily extensible and contractile and are very richly supplied with the nettle cells so characteristic of Cœlenterata (q.v.). In a specimen the float of which is 8 inches long, these filaments trail out to a distance of fully 20 feet. The batteries of nettle cells are so numerous and so powerful that fishes of considerable size are paralyzed by coming in contact with them and devoured, the latter process, however, being performed chiefly by other individuals that are specially devoted to the process of digestion. The nettle cells of a specimen of *Physalia* of average size are powerful enough to produce great and sometimes serious discomfort to human beings if they come in contact with the hands or arms; and this is sometimes the result when dead specimens are picked up from the beach. The most common Portuguese man-of-war in the western Atlantic is *Physalia pelagica*, which has the float 6 or 8 inches long and 2 or 3 inches high. The float is a bright, iridescent blue, shading in some places into purple, with the lower part and edges red. The individuals of the colony are chiefly red, though various parts are blue. The float contains a gas, possibly air, which seems to be secreted by glandular epidermal epithelium at its bottom. The gas can be expelled through an air pore, by which the interior is always in communication with the outside. By contraction of its float the animal can sink below the surface, to which it rises again during calm weather. Portuguese men-of-war are found chiefly in the warm seas, and in some places in the tropics large numbers are blown ashore when the wind has blown landward for an unusual length of time. They are also carried northward in the Gulf Stream and during the latter part of the summer are often seen off the southern coast of New England.



PORTUGUESE MAN-OF-WAR.

a, swimming bell; *b*, crest of same; *c*, reproductive zoids; *d*, nutritive zoids (tentacles).

PORTUGUESE POLITICAL PARTIES. See POLITICAL PARTIES, *Portugal*.

PORTUGUESE VERSION. See BIBLE.

PORTUGUESE WEST AFRICA. Angola, a Portuguese colony. See ANGOLA.

PORTULACA, pōr′tů-lā′kȧ; commonly pōr′-tů-läk′ȧ (Lat., *purslane*). A genus of dicotyledonous herbs belonging to the Portulacaceæ (purslane family). It includes about 20 species, nearly all of which are natives of America. One of the most widely naturalized weeds is *P. oleracea* (purslane); while *P. grandiflora* is cultivated under a large number of forms differing in color and size of flowers.

PORTU′NUS, or **PORTUM′NUS** (Lat., from *porta*, door, *portus*, port). The Roman divinity, originally of doors, then of harbors, and hence represented with a key. Later, he was identified with Palæmon (q.v.). His festival, the Portunalia, was celebrated annually on August 17. Consult: W. W. Fowler, *Roman Festivals* (London, 1899); id., *The Religious Experience of the Roman People* (ib., 1911); Georg Wissowa, *Religion und Kultus der Römer* (2d ed., Munich, 1912).

POR′TUS HER′CULIS LIBUR′NI. See LEGHORN.

PORTUS ITIUS. See ITIUS PORTUS.

PORTUS LABRO′NIS. See LEGHORN.

PORTUS NAONIS. See Pordenone.

PORT WASHINGTON. A city and the county seat of Ozaukee Co., Wis., 26 miles north of Milwaukee, on Lake Michigan and on the Chicago and Northwestern Railroad (Map: Wisconsin, F 5). It has gasoline engine works, chair and woodenware factories, foundries, breweries, etc. Pop., 1900, 3010; 1910, 3792.

PORT WINE. See Methuen Treaty; Wine.

PORT WINE MARK. See Naevus.

PO′RUS (Lat., from Gk. *Πῶρος*, *Pōros*) (?–317 B.C.). An Indian king, the most powerful of those conquered by Alexander the Great (q.v.). His kingdom lay in the north of India between the Hydaspes and Acesines (the modern Jhelam and Chenab), and he was a monarch of much importance and ancient lineage. When Alexander reached the Jhelam in his invasion of India in the spring of 326 B.C., he found Porus awaiting him with a strong army on the further bank of the Hydaspes (Jhelam) River. After some delay the Macedonian force succeeded in crossing the river by stratagem, and a fierce battle ensued, in which Porus was wounded and made captive. When the conqueror retired from India in the following year, he left Porus, as a token of respect for his bravery, ruler over the lands west of the Jhelam, comprising seven nations, and in addition made him an ally of his former enemy and rival Taxiles, probably Ambhi Raja of Takshasila. After the death of Alexander Porus seems to have extended his power over Sind by expelling Peithon, the Greek ruler. In 317 Porus was assassinated by Eudemus, who had been made satrap of the Punjab by Alexander to administer its affairs with Taxiles. The name Porus obviously represents the Sanskrit, *Pāurava*, or member of the race of Puru, a legendary monarch of the so-called lunar dynasty, whose descendants are represented by the Sanskrit writings as dwelling in the north of India.

The same name was borne by at least two other kings, one a nephew and an enemy of the great Porus. He was driven by Alexander from his country of Gandaris (Skt. *Gandhāra*), on the left bank of the Indus. There was also a Porus, King of Madura, who sent gifts and an embassy to the Emperor Augustus. Consult: J. W. M'Crindle, *Invasion of India by Alexander the Great* (2d ed., London, 1896); V. L. Smith, *Early History of India* (Oxford, 1908); A. A. Macdonell, *History of Sanskrit Literature* (London, 1913).

POR′Y, John (c.1570–1635). An English colonist and geographer. He graduated at Gonville and Caius College, Cambridge, in 1592, studied history and geography for a time after 1597 under Richard Hakluyt, and in 1600, at Hakluyt's suggestion, made a translation of the *Geographical Historie of Africa, written in Arabicke and Italian by John Leo, a More,* which at that period was considered the only original authority concerning north and Central Africa. From 1619 to 1621 he was secretary to Sir George Yeardley, Governor of Virginia. While in Virginia he made several excursions among the Indians, the accounts of which, in Smith's *Generall Historie,* are of historical interest. He returned to England in 1621, but in 1623 went back to Virginia as a commissioner from the Privy Council.

POSADAS, pŏ̇-sä-′däs, Count of. See Fernández de Córdoba, Diego

POSADOWSKY-WEHNER, pō′zȧ-dôf′skē̇-vā′nẽr, Arthur Adolf, Baron von Postelwitz, Count von (1845–). A German statesman, born at Grossglogau, Silesia. After studying law and political science at Heidelberg, Berlin, and Breslau, he became Landrat in 1873. As a deputy to the Prussian House of Representatives in 1882–85 he sided with the Free Conservatives. Made head of the provincial administration of Posen in 1889, he completely reorganized the administration of the province and in 1893 was appointed State Secretary of the Imperial Treasury. Succeeding Bötticher as Minister of the Interior in 1897, he was intrusted with the representation of the Imperial Chancellor and made Prussian Minister of State. The German tariff of 1902 was one of the prominent results of his administration. Resigning in 1907, he entered the Prussian House of Lords and in 1912 became a member of the Imperial Diet. Posadowsky-Wehner wrote several pamphlets on social questions—old-age insurance, housing, etc.—and a history of his family (1891). Consult Penzler, *Graf Posadowsky als Finanz-, Sozial-, und Handels-politiker* (4 vols., Leipzig, 1907–11).

POSCHINGER, pŏ̇sh′ĭng-ẽr, Heinrich, Knight von (1845–1911). A German administrator and author. He was born at Munich, studied law there and in Berlin, was for some years employed in the Bavarian state service, and in 1876 entered the Imperial employ as assistant in the chancery office. Afterward he removed to Berlin, entered the Department of the Interior, and became governmental Privy Councilor. After Bismarck's death he left the government service and removed to Nice. He wrote: *Bankgeschichte des Königreichs Bayern* (1874–76); *Banken im deutschen Reiche, Oesterreich und Schweiz* (1877); *Bankwesen und Bankpolitik in Preussen* (1878–79); *Preussen im Bundestag* (2d ed., 1882–85); *Lasalles Leiden* (4th ed., 1889); *Fürst Bismarck als Volkswirt* (1890); *Ansprachen des Fürsten Bismarck* (1894–99); and many other works on Bismarck (for the most part examined and approved by the Chancellor), on politics, and on banking. Poschinger edited, besides many documents relating to Bismarck, *Denkwürdigkeiten des Ministerpräsidenten Otto Freiherr von Manteuffel* (1901) and *Kinkels sechsmonatliche Haft im Zuchthause zu Naugard* (1901). A drama, which he wrote in 1905, in coöperation with Schick, and called *Bei Fürst Bismarck*, was forbidden by the censor.

POSEIDIPPUS. See Posidippus.

POSEIDON, pŏ̇-sī′don. See Neptune.

POSEN, pō′zen. A province of Prussia, bounded by Pomerania and West Prussia on the north, Russian Poland on the east, Silesia on the south, and Brandenburg on the west (Map: Germany, G 2). Its area is 11,194 square miles. The surface is mostly flat. There are extensive tracts of wooded marshland, now partially converted into agricultural land. Posen is watered principally by the Warthe and the Netze and to some extent by the Vistula. There are a large number of lakes and some important canals. Posen is chiefly an agricultural country. Over 60 per cent of its area is under tillage and in gardens. In the distribution of land large holdings prevail, about 58 per cent of the productive land being divided into estates of 250 acres and over. Rye, wheat, oats, barley, and potatoes are produced extensively and partly exported. Large quantities of sugar beets are raised for local sugar mills. In 1913 there were under rye

713,132 hectares; potatoes, 301,383; oats, 164,564; barley, 129,687; wheat, 79,354. Cattle raising is important. The number of cattle in 1913 was about 942,500; horses, 301,400; sheep, 242,000; goats, 148,800; swine, 1,322,000.

The manufacturing industries are only slightly developed and employ (including all other industries outside of agriculture) only 20 per cent of the total population. The principal manufactures are spirits (of which Posen is one of the chief producers in Germany), beet sugar, machinery, bricks, and wooden wares. The exports include grain, cattle, wood, and wool. The railway lines have a total length of over 1200 miles, almost exclusively controlled by the state. Posen is divided administratively into the two districts of Posen and Bromberg, with the city of Posen as the capital. In the Prussian Landtag the province is represented by 19 members in the upper and 29 delegates in the lower chamber. It returns to the German Reichstag 15 members. The population increased from 1,583,843 in 1871 to 1,751,642 in 1890, 1,887,275 in 1900, and 2,099,831 in 1910. In 1910 over two-thirds of the people (1,394,014) lived in communes of less than 2000. The only large city is Posen (pop., 156,691). In 1910 Roman Catholics, mostly Polish, numbered 1,422,238 (67.73 per cent); Evangelicals, mostly German, 646,580 (30.79); Jews, 26,512 (1.26). The Polish language and its dialects are spoken by the majority of the inhabitants. Posen formed a part of Poland till the first partition of that country in 1772, when Prussia acquired the districts north of the Netze. The other portion was taken by Prussia at the second partition in 1793. In 1807 it was annexed to the Duchy of Warsaw, but was restored to Prussia in 1815, receiving the title of a grand duchy. Posen has been the scene of bitter strife between the Polish and German elements, and the Prussian government has resorted to arbitrary measures in its efforts to Germanize the region. In 1914 it was the objective of a Russian campaign against Germany. See War in Europe.

POSEN (Pol. *Poznan*). The capital of the province of the same name in the eastern part of Prussia, situated in a sandy plain at the confluence of the Cybina with the Warthe, 90 miles north of Breslau (Map: Germany, G 2). It is a first-class fortress, with a strong garrison, and is an important railway centre. Its appearance has been greatly improved by the building of new quarters and the construction of modern buildings. Of its numerous churches the most noteworthy are the eighteenth-century cathedral, well known for its golden chapel and for its fine monuments and the bronze statues of the first two Christian kings of Poland, the seventeenth-century parish church, and the fifteenth-century Gothic Marienkirche, the oldest church in Posen. The principal secular edifices are the old town hall, rebuilt after the fire of 1536 and adorned with a slender tower 214 feet high; the adjoining modern town hall, in Renaissance; the royal castle (1905–10), in so-called Romanesque; the Raczynski Palace, with the library of the same name; and the German theatre. Posen has a Roman Catholic and an Evangelical Gymnasium, a seminary for teachers, and one for Catholic priests. There is an Emperor William Library, with upward of 200,000 volumes. The old fortifications were demolished in 1902. The new ones comprise about 12 inner and 20 outer forts. The principal manufactured products are machinery of various kinds, spirits, flour, furniture, sugar, and cigars. There is an active trade in wood, grain, wool, potatoes, and spirits. Pop., 1900, 117,014; 1910, 156,691. The inhabitants are principally Roman Catholic, more than half Polish and about one-tenth Jewish.

Posen is one of the oldest cities of Poland. It became the see of a bishop in the tenth century and was the residence of the early Polish monarchs. It was a member of the Hansa and attained great prosperity in the sixteenth century, but afterward declined, its population in the eighteenth century having dwindled to about 12,000. The western part of the city, on the left bank of the Warthe, was founded by Germans in 1253 and had a separate administration until the annexation of Posen to Prussia in 1793.

POSEY, pō′zĭ, Thomas (1750–1818). An American soldier. He was born in eastern Virginia, but removed to the western part of the Colony in 1769, became quartermaster under Gen. Andrew Lewis in Dunmore's War (q.v.), and took part in the battle of Point Pleasant in 1774. Early in 1775 he became a member of a Virginia Committee of Correspondence, and the next year helped defeat Lord Dunmore at Gwynn's Island. As captain he served in the campaign against Burgoyne, distinguishing himself in the battles of Saratoga. In October, 1778, promoted to major, he commanded a regiment sent against the Indians in the Wyoming valley; in 1779 he commanded a battalion under Wayne and was conspicuous at the Stony Point assault and subsequently (1781–82) served under Wayne in Georgia and helped to repel an attack of Indians under Gueristersigo. In 1793 he became a brigadier general and led a division of Wayne's army against the Indians. He settled in Kentucky in 1794 and became successively State Senator, Lieutenant Governor (1805), and major general of militia (1809). Subsequently he removed to Louisiana and was United States Senator from that State (1812–1813). From 1813 to 1816 he was Governor of Indiana Territory and then for two years was an Indian agent.

POS′IDIP′PUS, or **POSEIDIPPUS** (Lat., from Gk. Ποσείδιππος, *Poseidippos*). A Greek comic poet, the last exponent of the new comedy, dating from the first half of the third century B.C. He was born at Cassandria in Macedon, lived at Athens, and wrote 40 comedies, of which 18 titles have come down to us, and a few fragments, published in Th. Kock, *Comicorum Atticorum Fragmenta*, vol. iii (Leipzig, 1888). His *Didymoi* (The Twins) was the original of Plautus's *Menæchmi* and, through Plautus's play, of Shakespeare's *Comedy of Errors*. It is probable that others of his plays were imitated by the Roman comedian. A remarkably fine statue of Posidippus is in the Vatican at Rome. Consult Christ-Schmid, *Geschichte der griechischen Litteratur*, vol. ii, part i (5th ed., Munich, 1911).

POS′IDO′NIA (Lat., from Gk. Ποσειδωνία, *Poseidōnia*). The ancient name of Pæstum (q.v.).

POS′IDO′NIUS (c.128–45 B.C.). A Stoic philosopher, born at Apamea in Syria. He was a pupil at Athens of Panætius, whom he succeeded as the leader of the Stoics, and was a teacher of Cicero, who frequently speaks of him with praise. Pompey visited him (67 B.C.) at Rhodes, where the greater part of his life was passed, and again (62 B.C.) after the close of the

Mithridatic War; and Posidonius wrote a history of the wars of Pompey. He went to Rome in 51 B.C. Besides his philosophical works he wrote treatises on history, astronomy, and geography, of which we have only the titles and a few quotations preserved by Cicero, Strabo, and others. He wrote *Meteorologica*, and Cicero alludes to his artificial sphere, which represented the motion of the heavens. The slight fragments from his works are published in Müller's *Fragmenta Historicorum Græcorum*, vol. iii (Paris, 1851). Consult: Eduard Zeller, *A History of Eclecticism in Greek Philosophy* (Eng. trans., by S. F. Alleyne, London, 1883); R. D. Hicks, *Stoic and Epicurean* (New York, 1910); E. V. Arnold, *Roman Stoicism* (Cambridge, 1911); Ritter-Preller, *Historia Philosophiæ Græcæ* (9th ed., Gotha, 1913).

POSIDONOMYA, pŏs′ĭ-dŏn′ȯ-mī′ȧ (Neo-Lat., from Gk. Ποσειδῶν, *Poseidōn*, Neptune + *μῦς*, *mus*, shellfish). This genus of schizodont Pelecypoda is noted for its continuous existence from Silurian to Jurassic time. It includes more than 50 species, some of which are everywhere profuse in the Jurassic and Triassic strata. The shells are subcircular, thin, compressed, with straight hinge line and equal valves, and lack hinge teeth.

POSILIPO, pȯ-zē′lė-pō. A mountain ridge 2 miles southwest of Naples, remarkable for the tunnel known as the Grotta di Posilipo, through which the road from Naples to Pozzuoli formerly passed. The grotto is in some places 70 feet high and 21 feet wide and is 2244 feet long. Strabo assigns its construction to M. Cocceius Nerva, superintendent of aqueducts in the time of the Emperor Tiberius. Above the east archway of the grotto is the so-called tomb of Vergil. At the base of the hill of Posilipo anciently stood the poet's villa, in which he composed the *Eclogues* and *Georgics*, if not also the *Æneid.* Since 1885 new tunnels have been built for the railroad and steam tramway to Naples. Near by is the village of Posilipo, with 4500 inhabitants.

POSI′TION. See HARMONY, *Chords;* VIOLIN.

POSITION, RULE OF FALSE. See FALSE POSITION, RULE OF.

POSITION-FINDER. See RANGE-FINDER.

POSITION OF SHIP. See NAVIGATION.

POS′ITIVISM (from OF., Fr. *positif*, from Lat. *positivus*, settled by arbitrary appointment, from *ponere*, to place). A term invented by Auguste Comte (q.v.) to designate his system of philosophy, inasmuch as that system purported to exclude all metaphysical theorizing and to confine itself to "positive" scientific knowledge of facts. It attempted to reduce the whole universe to experiential terms, excluding supernatural and spiritual agencies, hidden forces and immaterial essences, and causation regarded as a mysterious tie binding phenomena together. Instead of causes it looked for laws, i.e., the uniformities of coexistence and sequence among phenomena. When a certain uniformity has been discovered, no reason can be assigned, it declared, for that uniformity. The uniformity is an ultimate fact given us by our experience, and reasons for facts cannot be discovered. Views fundamentally like Comte's, in a greater or a less degree, may be discovered in Greek philosophy, especially among the Sophists. In modern times, beginning with Hume, positivistic views, though not so called till Comte's time, have been widely held. Prominent among German Positivists, developing from Kant, are Laas (q.v.), Riehl (q.v.), T. Ziegler, and F. Jodl. Allied in their positivism with these are such thinkers as Schuppe, Rehmke, and Avenarius. In England positivism has attempted to institutionalize itself by the establishment of a church with ritual, ceremonials, and the like, all in the worship of humanity. This tendency has its point of departure in Comte's religion of humanity. The leaders of this movement have been R. Congreve and Frederic Harrison. Of the last generation Lewes (q.v.) was the English protagonist of positivism, but he was interested more in its philosophical than in its religious side. In France E. Littré and H. Taine have been the most noted Positivists, while Renan was greatly influenced by Comte's doctrines.

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PO′SO. See CHICA.

POSSART, pŏs′ärt, ERNST, KNIGHT VON (1841–). A German actor and theatre director. He was born in Berlin and was early an actor at Breslau, Bern, and Hamburg. Connected with the Munich Court Theatre after 1864, he became its oberregisseur in 1875. In 1877 he was made director of the Bavarian royal theatres; in 1887–92 toured the United States, Germany, Russia, and Holland; in 1895–1905 was intendant of the Bavarian Hoftheater; and in 1901 opened the Prince Regent's Theatre. In the private royal theatre (the Residenz) he produced several of Mozart's operas. Among his own rôles were Nathan, Gessler, Mephisto, Iago, and Shylock. He edited German versions of *Lear* (1875), *The Merchant of Venice* (1880), and *Coriolanus;* wrote the plays *Der deutsch-französische Krieg* (1871), *Recht des Herzens* (1898), and *Im Aussichtswagen* (1898); and published *Aufgabe der Schauspielkunst* (1895), *Lehrgang des Schauspielers* (1901), and descriptions of many of his own productions.

POSSE (pŏs′sė) **COM′ITA′TUS** (ML.). A legal term meaning power of the county. "Whenever, in the opinion of the sheriff, the responsible conservator of the peace, such a course becomes necessary, he may summon to his assistance what is known as the *posse comitatus*, that is, the body of male citizens of the county above 15 years of age, and may command them to aid him in the execution of process, in the preservation of peace, and in the performance of other lawful duties requiring and involving the use of physical force." So states Davis in his *Treatise on the Military Law of the United States.* "The several grants of power to the Executive in connection with the use of military force are coupled with an important statutory restriction which makes it unlawful 'to employ any part of the army of the United States, as a *posse comitatus* or otherwise, for the purpose of executing the laws, except in such cases and under such circumstances as such employment of said force may be expressly authorized by the Constitution or by Act of Congress.' " (Sec. 15, Act of June 18, 1878, 20 Stat. at Large, 152.)

POSSES'SION (Lat. *possessio*, from *possidere*, to possess). In law, the actual present dominion or control which a person may have over a parcel of land or a chattel. The degree and kind of control necessary to constitute possession vary with the nature of the thing possessed and with the habits of the community.

Possession is a fact and is quite independent of any legal right to the thing possessed. A thief possesses the thing he has stolen, and the person who has surreptitiously or by force placed himself in control of a house possesses the house.

To the possessor as such, without regard to his right to possess, every legal system, even in the highest stage of development, accords certain advantages. The possessor is protected against every one who has no better right than himself. He is protected against disturbance (trespass), and if wrongfully dispossessed he recovers possession simply on the ground of his prior possession and the wrongfulness of the dispossession. Even when his adversary has a superior right to possess, the possessor may be protected against forcible dispossession.

Further, possession is, as the English lawyers express it, a "root of title." At Roman law ownership cannot be acquired without acquisition of possession, although when acquired it survives the loss of possession. Finally, in every system of law possession ripens by prescription (q.v.) or adverse possession into full property right.

In determining to what persons and under what circumstances the legal advantages of possession shall be accorded, every legal system develops a somewhat artificial doctrine of possession.

The law of possession is less clearly developed in the English law than in the Roman and the modern civil law. This is owing partly to the fact that the English law employs the same actions, viz., trespass, ejectment, and trover, for the protection of possession and for the enforcement of property rights, while the Roman law has distinct possessory remedies. In their practical operation, however, the two systems attain substantially similar results.

In both systems (as indeed in every legal system) the person who has physical control of a thing and holds it for himself—the person who, as the Roman jurists express it, has both the *corpus* of possession and the *animus possidendi*—is a legal possessor. Those who hold for others are differently treated in different systems. In no legal system are they possessors as regards prescription; but as regards protection against disturbance and against dispossession distinctions are drawn. Servants and employees acting under the direction of a master or employer are generally regarded as mere custodians. They have no independent possession, but, as it is sometimes put, their possession is the possession of the one employing them. Agents, bailees, and lessees are not possessors at Roman law; but in the modern civil law and in English law they have all the possessory remedies, at least against strangers, and they are therefore usually called possessors. If, as is usually the case in modern, though not at common, law, possessory remedies are given also to those for whom they hold possession, the latter (principals, bailors, and lessors) are said to have constructive or mediate possession. Pledgees and mortgagees who have physical possession are treated as legal possessors in every system of law.

The denial of possessory remedies to the person who holds for another does not exclude the right of defending physical possession against wrongful aggression. It signifies simply that if judicial proceedings are necessary, they must be taken by, or at least in the name of, the person for whom the property is held.

One of the chief differences between Roman and English law is found in the greater protection which the Roman law gives to the possessor of a movable against the person who has the right to possess. At Roman law, if the owner takes property forcibly from the possessor, he is obliged to restore it and pay damages; he cannot justify his employment of force by showing his right to possess. (It must be remembered, however, that at Roman law bailees and agents are not possessors.) At English law the owner of goods is permitted to use reasonable force for their recapture, even against a third person who has acquired them innocently with color of title. As regards realty the statutes against forcible entry have placed the English law on nearly the same footing as the Roman.

He who has acquired possession from another person by force or by stealth or by license is said, in the Roman and modern civil law, to have a vicious, or defective, possession. As regards that person he is protected against forcible dispossession, but not against disturbance (trespass). As against all other persons, however, vicious possession enjoys, as in English and American law, the same protection as any other kind of possession.

To the *bonæ fidei* possessor, i.e., to the person who not only possesses, but believes that he has a right to possess (a belief which regularly implies color of title), Roman and modern civil law give greater advantages than to the *malæ fidei* possessor. The honest possessor, when evicted by the owner, is not accountable for *fructus* or mesne profits no longer in his possession; or, as the civilians express it, he has the right of consumption and even the right of waste. Again, the honest possessor alone may acquire title by prescription. Finally, the honest possessor has an action for recovery of possession which runs against all the world, by which he prevails over every possessor who has not at least as much color of title as he has, and which, unlike the ordinary possessory remedies, is not limited to a brief term. These distinctions are generally drawn in modern civil law, but not in English law. In English and American law the honest possessor is accountable for mesne profits; he has no advantage as regards the perfecting of his title by lapse of time; and the actions of ejectment and trover may be employed by the dishonest possessor as well as by the honest possessor. In these English actions, however, the relatively better title prevails, so that substantially the same result is reached as in the Roman law.

In order to acquire legal possession a much more complete control must be established when the thing seized was not previously in any one's possession (as in the capture of wild animals, birds, and fishes), or when the thing is taken without the consent of the prior possessor (disseisin), than is necessary in cases where possession is voluntarily transferred by a prior possessor. In case of delivery of possession, it it necessary only that the new possessor gain the degree of control ordinarily held by an owner.

In English and American law a further distinction is drawn between the person who has a right to possess and the person who has no such right. He who has a right to possess becomes legal possessor, even without the consent of the prior possessor, as soon as a partial control is established. This is one of the meanings attached to the English maxim that possession follows title. Another meaning is that, when it is uncertain who has the physical control, legal possession is with the person who has the better right to possess.

Legal possession is lost, in all legal systems, when physical control is lost. Control, however, as previously stated, does not mean complete control; and possession once established usually continues until the possibility of control is lost. Apart from the case of animals *feræ naturæ*, this usually occurs only when an adverse possession is established.

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POS′SET (probably from Ir. *pusoid*, posset, Welsh *posel*, curdled milk, from *posiaw*, to gather). A dietetic preparation, made by curdling hot milk with wine, ale, vinegar, or other acidulous liquor. White wine or sherry is usually preferred, or old ale may be used.

POSSEVINO, pŏs′sȧ-vē′nȯ, ANTONIO (c.1534–1611). An Italian Jesuit and papal diplomat, born at Mantua. He studied at Rome, and became rector of the Jesuit College at Avignon. In 1577 he was dispatched to Sweden to effect a return of that country to the Roman communion, but he accomplished nothing permanent. In 1581 as the Pope's Viceroy as arbiter between Poland and Russia he aided in establishing peace (1582), but failed to unite the Greek and Roman churches. However, he secured religious freedom for Roman Catholic merchants and safe-conduct for papal nuncios and missionaries. Subsequently he was active as ambassador and missionary and in 1587–91 lectured at the University of Padua. In addition to numerous controversial writings he published *Moscovia, sive de Rebus Muscoviticis* (1586), containing a narrative of his own embassy; *Bibliotheca Selecta de Ratione Studiorum* (1593); and *Apparatus Sacer ad Scripturam Veteris et Novi Testamenti* (1603–06), an extensive and painstaking though not uniformly critical presentation of the sources of general theology.

PÖSSNECK, pẽs′nĕk. A town of Saxe-Meiningen, Germany, situated 54 miles southwest of Leipzig. It has a Gothic church of the fourteenth century and a Gothic town hall of the fifteenth century. The chief manufactures are woolen and leather goods, porcelain, musical instruments, and dyes. Pop., 1900, 12,266; 1910, 12,934.

POST, ALFRED CHARLES (1806–86). An American surgeon, born in New York City. He graduated from Columbia College in 1822 and from the College of Physicians and Surgeons in 1827, studied in Paris, Vienna, Berlin, and London (1827–29), was professor in the Castleton Medical College, Vermont (of ophthalmic surgery, 1842–44, and of surgery, 1844–51), professor of surgery in New York University (1851–75), emeritus professor (1875–86), and president of the medical faculty (1873–86). He was a fellow of the Academy of Medicine, of which he was president in 1867–68. Post wrote *Observations on the Cure of Stammering* (1841). He was the inventor of several surgical instruments and appliances.

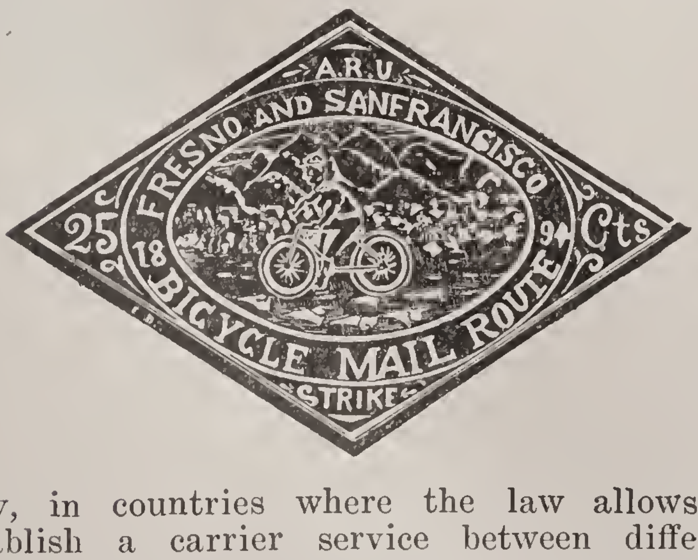
POST, GEORGE BROWNE (1837–1913). An American architect, born Dec. 15, 1837, in New York City. He graduated in civil engineering from New York University in 1858, and studied architecture under Richard M. Hunt (q.v.) in 1859–60. At the outbreak of the Civil War he went to the front as captain in the Twenty-third New York Volunteers, and before the close of the war had risen to the rank of colonel. He practiced architecture in New York City in partnership with Charles D. Gambrill for two years (1865–67), but afterward worked independently until late in life, when he was associated with his sons, W. S. and J. O. Post. Mr. Post was one of the remarkable group of New York architects which included R. M. Hunt, W. R. Mead, C. F. McKim, and others, who, with Richardson of Boston, were the leaders in the revival and upbuilding of American architecture between 1875 and 1890, and his work down to his last days was as virile as that of his youth and more scholarly and refined. He designed the original Equitable and Western Union buildings, the Produce and Stock exchanges, the World Building and the City College group and the residence of Cornelius Vanderbilt—all in New York; the Long Island Historical Society's building in Brooklyn; the Prudential Building in Newark, N. J., the Liberal Arts Building at the Chicago Columbian Exhibition, the Wisconsin State Capitol, and many other important civic, private, and commercial buildings. In 1908 Columbia University conferred on him the degree of LL.D. At various times Post served as president of the Architectural League of New York, the American Institute of Architects, the Fine Arts Federation, and the National Arts Club. He became a Chevalier of the Legion of Honor in 1901, an associate (1907) and a member (1908) of the National Academy of Design, and from 1909 until his death was a member of the National Commission of Fine Arts. In 1910 he received the gold medal of the American Institute of Architects. His death occurred Nov. 28, 1913.

POST, GEORGE EDWARD (1838–1909). An American medical missionary, born in New York City, where he graduated M.D. from the university of the city (1860) and from Union Theological Seminary (1861). He was elected professor of surgery at the Syrian Protestant College at Beirut, a chair which he held until his death. At the same time he was surgeon to the Johanniter Hospital. He was a son of Alfred Charles Post. Post was well known as a linguist, and wrote on many subjects in several languages. In Arabic he wrote: *Flora of Syria, Palestine, and Egypt; Textbook of Botany; Textbook of Mammalia; Textbook of Birds; Translation of Butler's Physiology; Concordance to the Bible; Textbook of Surgery; Textbook of Materia Medica; Dictionary of the Bible.* In English appeared his *Flora of Syria, Palestine, and Sinai* and in Latin and French *Plantæ Postianæ.* He also contributed to Smith's, Hastings', Jacobus', and Barnes's dictionaries of the Bible.

POST, Guy Bates (1875–). An American actor, born at Seattle, Wash. He attended the University of California and studied law in his native city. He entered on his stage career in 1893, made his first New York appearance in 1901 in *My Lady Dainty,* and then played in *The Bird in a Cage* (1903), *Major André* (1903), and *The Virginian* (1904). He created the leading rôle in *The Heir of the Hoorah* (1905–07), was leading man with Mrs. Fiske in 1907–08, appearing in *Leah Kleschna, Tess of the D'Urbervilles,* and *Hedda Gabler,* and toured in 1909. Subsequently he played in New York in *The Bridge* (1909), *The Nigger* (1909), *The Witch* (1910), *The Challenge* (1911), *The Bird of Paradise* (1911–12), *Omar the Tentmaker* (1914).

POST, Wright (1766–1828). An American surgeon, born at North Hempstead, Long Island. He studied medicine for six years in New York and London, and began to practice in New York in 1786. In 1792 he became professor of surgery, and afterward of anatomy and physiology, in Columbia College. He visited the celebrated schools of Europe, and returned in 1793 with a splendid anatomical cabinet. In 1813 he became professor of anatomy in the College of Physicians and Surgeons, and he was its president from 1821 to 1826. Post was one of the pioneers among American surgeons, and is still remembered as a successful operator, especially in the ligation of vital arteries.

POSTAGE STAMPS (from *post,* from Fr. *poste,* from ML. *posta,* station, fixed place on a road, from Lat. *postus, positus,* p.p. of *ponere,* to place). Printed labels issued by individuals, corporations, or governments, acting as carriers of letters or packages, to signify that the charges required for forwarding them have been prepaid. The postage-due or unpaid-letter stamp is not a postage stamp, but is merely a convenient means of indicating that a certain amount is due for a carrier's service which has been rendered. An individual or a corporation may, in countries where the law allows it, establish a carrier service between different points and issue stamps for the prepayment of charges. This was the origin and use of United States local stamps, which the laws at one period allowed, but now forbid. The suspension of the United States mail service in the neighborhood of San Francisco in 1894, on account of a railway strike, produced a brief evasion of the law in the establishment of a bicycle mail route between Fresno and San Francisco. The postage on mail by this route was prepaid by a 25-cent stamp. Such a local arrangement has but little authority and receives scant recognition. A higher grade is reached in the semiofficial issues whose originators were, in such cases as those of the Baltimore carriers, authorized by the United States government to charge one cent for the delivery of letters at the post office. Postmasters' stamps have even more of authority. The United States government, being unwilling to undertake the risk and expense of a general issue of postage stamps, allowed, in 1845, the postmasters of certain towns and cities to issue stamps at their own expense and for their own convenience to test the feasibility of their use. The postmasters of Alexandria, Va., Brattleboro, Vt., Lockport, N. Y., Millbury, Mass., Baltimore, Md., New Haven, Conn., New York, N. Y., Providence, R. I., and St. Louis, Mo., adopted the plan with so much success that the government undertook, in 1847, a general issue to supersede all the individual postmasters' issues.



The highest authority pertains to government issues, and consequently universal recognition is accorded to them. A sharp distinction, however, is made between established governments and pseudogovernments. The attempts of the Cuban Revolutionary Committee to raise revenue from stamps manufactured and sold in New York, which never prepaid an ounce of Cuban mail, and of Aguinaldo in the Philippines to foist labels issued by his unrecognized government on the collecting public, met with small success.

There are two kinds of stamps—the adhesive and those that are impressed upon the envelope or wrapper.

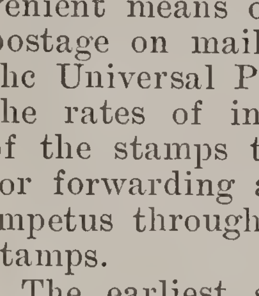
Adhesives are attached to packages before mailing. The only exception to this is found in the case of some United States newspaper stamps. The newspaper set of 1865 was attached to packages of newspapers, but the stamps of 1875 and following years were attached to the stubs of receipt books, the receipts being given to publishers of second-class mail matter sent through the mails at pound rates to show the amount that had been paid by them. The use of these stamps was at last judged superfluous and was discontinued. Official stamps were used by government officeholders in the United States to indicate the amount of postage that would have been paid had their mail matter been sent at the usual rates. No money, however, having been paid for these, they are in the nature of official franks, but a nominal value was given them as a means of keeping the accounts between the different departments. Their use was discontinued in 1882. It has become the practice of many

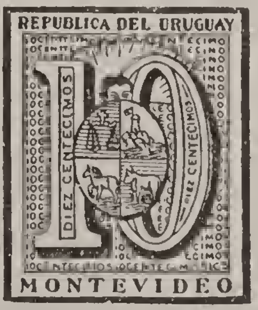
nations to celebrate important events by issuing a series of commemorative stamps. The centennial of the independence of the United States and most of the great expositions with the events they celebrate, as well as the centenary of Lincoln's birthday, were so commemorated in the United States. The centennial years of the South American republics were similarly celebrated.

The history of postage stamps begins with the issues made by Great Britain in 1840 under the administration of Sir Rowland Hill. The successful use of stamps in the postal service of Great Britain resulted in the adoption of stamps by Mauritius, an English colony, by Brazil, France, Switzerland, and the United States before 1850. The example was followed by many other countries, and since 1860 nearly all have adopted the postage stamp as the most convenient means of indicating the prepayment of postage on mail matter. The establishment of the Universal Postal Union, by means of which the rates of international postage, the colors of the stamps to be used, and the regulations for forwarding are determined, has given great impetus throughout the world to the issuing of stamps.

The earliest shape of the postage stamp is practically that which is in use to-day. The triangular, diamond-shaped, octagonal, and square have been tried as experiments by different countries, but in nearly all cases the return has been made to the rectangular form, and usually to about the same size as that of the original issue of Great Britain. Stamps have differed greatly in size, the smallest, a stamp of Bolívar, a state of the Colombian Republic, being ⅜ × ½ inch, and the largest the United States newspaper stamp of 1865, 2¼ × 3⅞ inches.

The original designs of the stamps of many countries are their finest; but there are notable cases in which the improvement both in design and in workmanship has been remarkable. A prominent example of this is found in the various issues for Uruguay. The earliest types, those of 1856–66, are of the most inferior workmanship, and the stamps are produced by the cheapest processes known. Stamps of the next decade show some improvement, while those of subsequent years contain some of the finest work of the period and also a number of specimens of poor work. The stamps since 1884, however, have been the finest possible examples that could be turned out under modern processes of engraving, and reveal from year to year the advances that have been made.

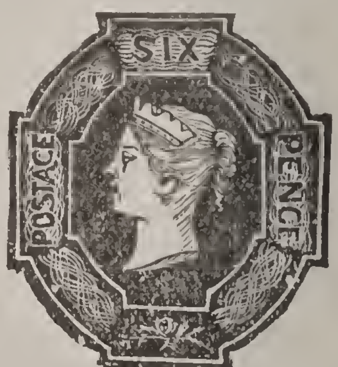




The methods of manufacture have changed greatly since postage stamps were first issued. The earliest stamps, in several countries, were each engraved separately by hand upon copper plates from which the impressions were taken. A notable example of this is the postmasters' stamps issued in St. Louis. This small plate of six stamps was engraved in two vertical rows of three stamps each, the first row of the 5-cent and the second row of the 10-cent denomination. The two upper 5-cent stamps were altered to 20-cent stamps, and later these were changed back to their original 5-cent denomination. Separate engraving was employed also in the cases of the early stamps of Mauritius, New South Wales, and the Philippine Islands.

The first adhesive stamp issued, the one-penny black of Great Britain, was made by a more advanced process. The original steel die, having been hardened, was impressed a number of times upon a softened steel roller which in turn was hardened, and under pressure rolled upon a plate from which the stamps were printed. By this means of transfer as many impressions could be made on a plate as desired, and the full sheets of these early issues contained 240 stamps. This method of engraving and transfer, with some improvements, is employed at the present time, and is utilized in the manufacture of the stamps of many countries. Another method in use has been the setting of separate electrotypes of a stamp side by side and then recasting them as a solid plate. Lithography also has been employed as a convenient and cheap method for producing stamps in quantity. Some countries have also made stamps by the use of ordinary type and rule, the design being repeated as many times as it was desired to have stamps in the sheet. Type-set stamps vary one from another. This is caused by slight differences in the type or its spacing, and in the cutting of the rule used for borders.

The common method of printing envelope stamps is by embossing, two dies being used in this case, one fitting into the other; the paper being placed between these and the flat surface of one die inked, a stamp is produced in which the raised portions are white and the level portions are inked. This method has been employed in the printing of a few adhesive stamps, notably those of Great Britain of the issue of 1841 and the first issues of Portugal and colonies.



Provisional issues of stamps have been made from time to time in different countries. This has sometimes been done for the purpose of providing a new denomination for immediate use before it was possible to obtain a new supply of the stamps from the printers. Provisional postage stamps are usually made by overprinting fiscal or telegraph stamps for postal use, or by surcharging certain values of postage stamps of which there is a surplus with a new value for which there is an urgent demand. Sometimes lithography is resorted to in countries where the regular issues are engraved, or some local printer is ordered to supply a small quantity of type-set labels.

In the earliest issues of stamps no means were provided for their easy separation. The stamps were intended to be cut apart, and in many cases were printed very close together.

The use of a machine for punching small holes between the stamps, known as a perforating machine, was begun in 1854, although there are instances, even at the present time, in which no provision is made for separation. Another method of separating stamps is by the use of the rouletting wheel, which cuts through the paper between the stamps with a series of small cuts such as would be made by brass rule, with an edge made up of alternate dashes and spaces, in printing. This rule also is sometimes used for the same purpose, and when it is inked the stamps thus treated are spoken of as rouletted in colored lines. The cuts are, in certain cases, made in zigzag or saw-tooth form, and are variously produced by rouletting wheels or by impressions with rule made for cutting.

Governments which have issued stamps sometimes reprint them after they have gone out of use. When these issues are good for postage they are called reissues. When, however, they are obsolete stamps which cannot be used for prepaying mail matter, they are known as reprints. It sometimes happens that the plates of government issues of stamps get into the hands of private individuals who reprint them for sale to collectors. These are known as private reprints, and are of much less value than government reprints because made without authority and usually in large quantities.

The processes employed in printing in many countries have been such as to encourage counterfeiting. Comparatively little trouble has been experienced by governments which have employed steel engraving for the production of their stamps. The expense and difficulty of successful imitation by the use of counterfeit steel plates has been such as to deter counterfeiters from attempting it. The lithographic process is usually employed by counterfeiters. The government of Spain changed its issues every year for a considerable period in order to defeat the aim of counterfeiters. Greece also has suffered considerably from counterfeits made to defraud the government.

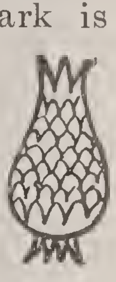
The collecting of stamps, sometimes known as philately, has several advantages over the gathering of other objects which satisfy the collecting instinct. The chief of these is the small space which is occupied by a large and valuable collection. There is also a standard of value by means of which the worth of stamps may be estimated. This is found in the standard catalogues, which, being based upon a knowledge of the number of stamps in existence and prices collectors are willing to pay for them, contain approximate valuation for most of them.

The separate engraving of stamps increases very much the interest in them. It has also led to a distinct kind of collecting known as plating. Collectors who are interested in doing this seek to restore the original plates of stamps by gathering together all the varieties that have been printed from them and placing them in their proper order in relation to one another.

Great countries are distinctly adverse to the use of the postal service in any other than its legitimate manner. There have been cases where British and French colonial authorities have arranged for special issues of stamps or have had overprints, or surcharges, placed upon them for the purpose of securing an increased sale to collectors, but these attempts have been frowned upon, and few of them are made at the present time.

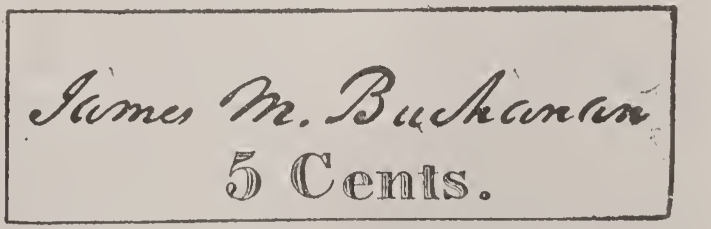
All collectors of stamps collect the perforated as distinct from the imperforate issues. The rouletted varieties are quite generally collected, and those who are especially interested in the smaller varieties notice the differences in the gauge of the perforation. This is determined by the number of holes that may be counted in the space of two centimeters, and a stamp is known as perforated 11, 13, 15, etc., according to the number of perforations included in that space.

Watermarks have been used by many countries as a means of guarding against the counterfeiting of their stamps. These are produced in the paper in the same way that the watermark is made in ordinary writing paper. It sometimes appears in the centre of a sheet or pane of stamps, and again the whole watermark is found in the space covered by a single stamp. The most common and interesting varieties of watermark are those found in the stamps of Great Britain and her colonies. It is sometimes quite difficult to discern the watermark, but a stamp placed in benzine upon a black surface usually shows it clearly. Collectors who are especially interested in minor varieties of watermark collect them when found inverted or sideways in the stamp as well as in their proper position. The misplacing of a sheet in the press frequently causes a watermark to appear at one side instead of at the centre of a stamp, and in some cases it is entirely lacking for this reason, and where the margin of a sheet contains lines or large letters, these are found in the stamps.



The colors of the paper on which stamps are printed appeal strongly to all collectors, also the quality of the paper itself. Collectors who are specialists note the differences of hard and soft paper. Thin and thick paper varieties are also collected.

The value of stamps depends, not, as is commonly supposed, upon their age, but upon the number that have been issued and the number preserved. Great countries, like the United States and the principal nations of Europe, issue large numbers of every stamp that they put into circulation. The stamp which corresponds to the ordinary letter rate in any large country is always common. Very old issues of small countries whose postal service was limited attain high value. Confederate postmasters during the War of Secession issued stamps of a class similar to United States postmasters' stamps. Some of these in fine condition are rare, bringing $500 each and upward, according to their condition. The United States Baltimore stamp of the 10-cent denomination, which differs from the 5-cent only in the numeral, is one of the rarest known. The first issue



of Mauritius brings a very high price, exceeding $2000 for a fine used specimen, and specimens of British Guiana are valued at $15,000. All early issues of stamps are continually increasing in value.

There are very valuable collections of stamps held in all the principal countries of the world. The British Museum owns one which was left to it by a member of Parliament and which contains very fine specimens of the rarest stamps of all countries. The most complete collection in the world is owned in France. Among the fine collections in the United States is the one in the United States National Museum in Washington, D. C.

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POSTAL SAVINGS BANKS. The system of savings banks conducted by various governments through the Post Office Department. This institution has become increasingly important since it was first introduced into England in 1861, and to-day all the principal nations of the world, except Germany, have adopted it. Its adoption in England was due to the inadequate facilities and incompetent management of the trustee banks. In 1860, out of a total of 638 of these banks, 350 were open only one day in the week, and then for only a few hours, while 20 towns and 14 counties, each containing over 10,000 inhabitants, were wholly without savings facilities. Similar conditions existed in the countries of continental Europe.

While differing in details in the various countries, the general features of the system are the same. Deposits may be made by any person at any post office. Depositors are provided with pass books, in which the amount of the deposit is entered by the local office, and within a few days an official receipt is mailed to the depositor from the general office. In rural communities carriers are allowed to receive deposits. Most countries provide for a minimum and a maximum deposit. The minimum is usually about 20 cents, but a card is issued upon which stamps may be affixed until they amount to that sum, when the card is taken by the bank and the deposit is credited. This device has been found especially adapted for use in schools. In England and France the fund representing the aggregate deposits is invested in government bonds. In other countries a wider latitude of investment is permitted, such as municipal and corporation bonds, real-estate mortgages, and even personal security. The deposit is in all cases guaranteed by the government. Interest on deposits is computed annually, the usual rate being 3 per cent. The maximum deposit is £200 in England and 1000 lire in Italy. If this sum be exceeded no interest is allowed on the excess. Withdrawals, like deposits, may be made from any post office. A delay of a few days is usually necessary for withdrawal, though a system of withdrawal by telegraph has been provided.

In the United States a postal savings system was inaugurated by act of June 25, 1910. Accounts are accepted for sums ranging from $1 to $500, but no person may deposit more than $100 in any one month. Postal savings cards and stamps are employed to encourage savings under $1. Two per cent interest is allowed for a full year. No interest is paid on deposits of less than a year. The depositor may exchange any part of his deposit for registered or coupon United States postal savings bonds issued in denominations of $20, $100, and $500, bearing interest at 2½ per cent. The volume of bonds purchased up to June 30, 1914, was $456,840. The number of depositors in the postal savings banks on June 30, 1914, was 388,511, and their aggregate deposits $43,444,271. Postal savings facilities were available at 9639 offices and 708 branch offices.

Postal savings banks usually serve two other functions besides receiving deposits. These are: (1) the providing of annuities and the writing of life insurance; (2) serving their customers as agents in purchasing government securities. Austria and Hungary have gone a step further and provided for accounts subject to check.

The following table, compiled from the 1914 Report of the Comptroller of the Currency, will give an indication of the relative importance of postal savings in the several foreign countries:

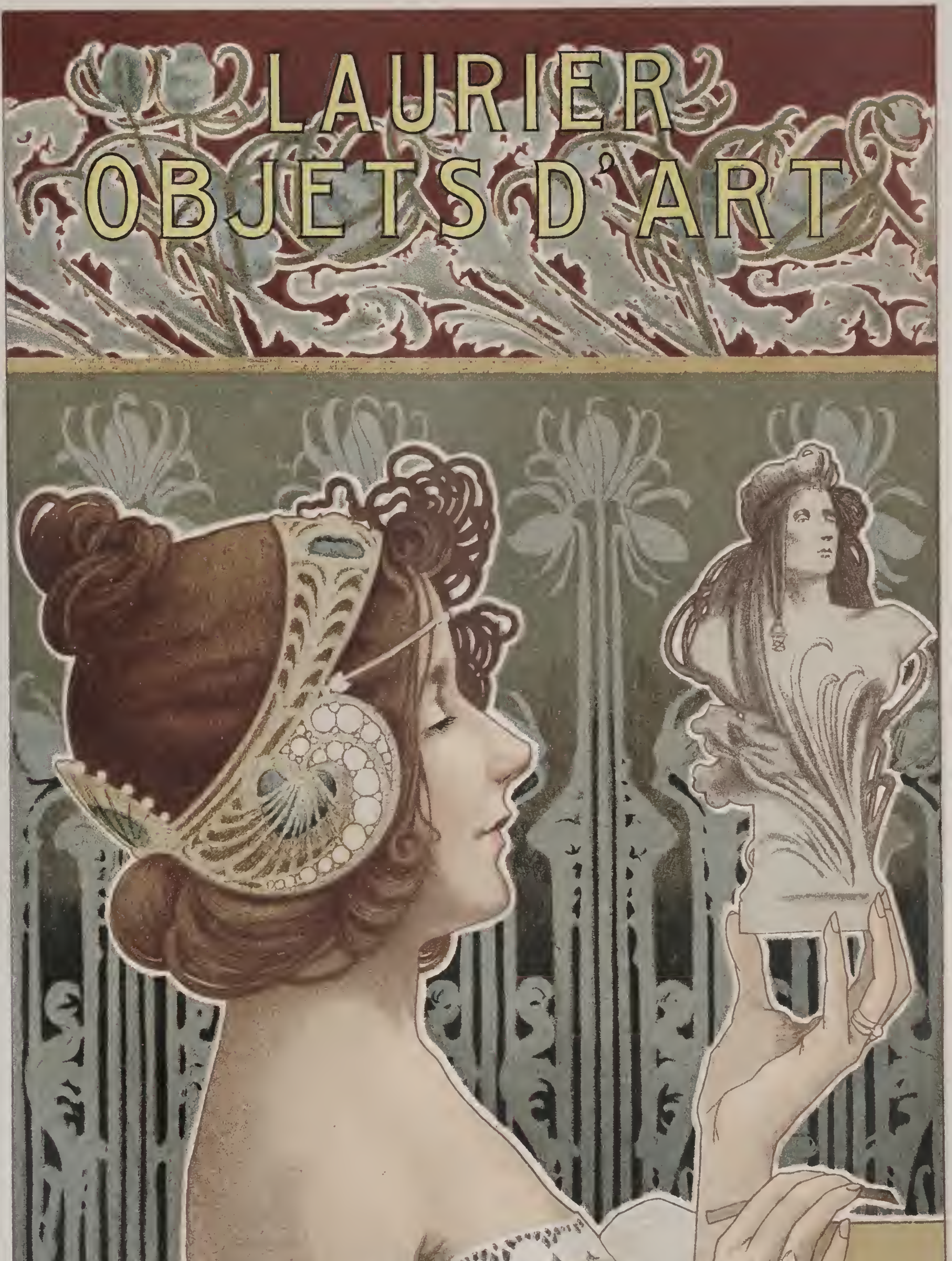
COUNTRIES	Number of depositors	Amount of deposits	Average per inhabitant
Austria (1913)	*2,300,407	$40,297,296	$1.40
	†122,870	79,561,438	2.77
Hungary (1912)	*836,143	21,983,784	1.05
	†24,104	22,027,751	1.05
Bulgaria (1911)	312,462	8,797,965	2.03
France (1912)	6,187,203	336,893,799	8.51
Italy (1912)	5,780,010	376,072,443	10.67
Netherlands (1912)	1,607,016	71,016,038	11.79
Finland (1911)	66,002	1,530,935	5.17
Sweden (1913)	575,700	12,885,976	2.30
United Kingdom (1912)	12,750,693	886,211,861	19.41
New Zealand (1913)	432,199	79,471,196	75.47
Canada (1913)	34,309	14,140,754	4.22

* Savings department. † Check department.

Consult: J. H. Hamilton, *Savings and Savings Institutions* (New York, 1902); A. P. C. Griffin (comp.), *List of Books Relating to Postal Savings Banks* (Washington, 1908); E. J. Robyns, *Les chèques et virements postaux: Etude économique et comparée* (Paris, 1913).

POSTEL, pô′stĕl′, Guillaume (1510–81). A French philologist and mystic, born in Dolerie, Normandy. In 1539, after some years in Constantinople, he was appointed to a chair in the Collège de France. The idea of converting the world had taken possession of him, and eventually he became disciple to an old Italian mystic, whom he calls Mother Jeanne and whose spiritual dominion he prophesies. He was professor in Vienna for a time, then wandered through Italy, being repeatedly imprisoned by the Inquisition, and on coming back to France was shut up in a monastery. Postel brought to France many valuable manuscripts, and in 1555

FRENCH POSTER



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published the first edition of the Syriac New Testament. His *De la république des Turcs* (1540; rev. 1560) has some historical value.

POSTELWITZ, pŏs′tel-vĭts, BARON VON. See POSADOWSKY-WEHNER, A. A., COUNT VON.

POST′ER. A sign, usually pictorial, intended to be affixed to a wall or board to convey some public announcement. The use of such signs is probably as old as civilization itself; but with the printing press came in a class of signs answering more or less to the specific modern use of the word "poster." In Paris in the seventeenth century posters printed on colored paper of one tone, such as yellow for the Opera House, green for the Comédie Française, and red for the Comédie Italienne, were generally used. The custom is continued in Paris of the nineteenth century, where white paper is reserved for governmental posters, and even the great national educational establishments have to use another color, generally yellow. In Italy the play bills were more descriptive, and in the eighteenth century they were often ornamented with cuts showing scenes and characters in the opera. In France as early as 1836 Lalance made a poster for the book *Comment meurent les femmes,* and Raffet, Grandville, C. Nanteuil, Gavarni, Gigoux, Vernet, Daumier, Tony Johannot, Frère, and Edouard Manet designed *affiches,* or posters, but not in colors. The modern colored poster was the invention of Jules Chéret, who commenced his long series of lithographs in color in 1866 and still ranks highest in the profession. By the use of few colors in strong contrast he produced the most fantastic pictorial effects. His subjects are ballet girls, clowns, or children, and his spontaneity, his engaging gayety, and the aptness of his detail make him without an equal in his restricted domain. Less suggestive, less conquering in color, but more decorative if more subdued, is the work of Eugène Grasset (1850–). Another more original poster maker is the often harshly realistic Toulouse-Lautrec, a powerful draftsman. The poster has kept pace with the impressionistic, the symbolistic, the realistic, and the romantic movements in literature and art. Willette, Forain, Guillaume, Auriol, Ibels, Steinlen, Mucha, Bonnard, Paléologue, Gossard, and Schwaebe are only a few names among the many poster designers who have worked in one or more of these styles. Another interesting phase of the poster is seen in those designs which serve also for book covers, the whole design, picture, lettering, and borders, given first as a poster 3 × 2 feet and afterward reduced to the size of an octavo page. These were first made by Chéret for Jules Lévy, the publisher. Both in the quality and the quantity of the work produced France is the leading nation in poster art. Compared with the French, English posters are rather sombre in color and conception. This note was struck in the first artistic poster in England made by Fred Walker for the dramatization of Wilkie Collins's *Woman in White* (1871). It was continued by the most original of English poster makers, Aubrey Beardsley, who influenced a crowd of imitators by his masterly exotic art. Walter Crane was the first to bring the color note into British poster art. The "Beggarstaff brothers" Pryde and Nicholson, with their grave artistic effects in black and brown, are interesting modern designers, and among others are Anning Bell, J. W. Simpson, Gordon Craig, Dudley Hardy, Greiffenhagen, J. Hassall, and Will Owen. The growth of the poster in other European countries was rapid, especially during the years from 1895 to 1900. In Germany the art culminated in the works of startling originality like those of Ludwig Hohlwein, Georg Tippel, Hans Flato, and others. In Spain posters advertising bullfights and fairs in vivid, often garish colors, were for long the only ones, but recently superior designers have appeared in Ramon Casas, "Marco," and others. In Russia the most prominent figure is Leon Bakst; in Belgium, Cassiers.

The first American posters advertised the circus and the stage, and one of the earliest of these poster makers was Matt Morgan, for some time head of a Cincinnati lithographing company. The makers of patent medicines then took it up; but practically all of this early work was crude and inartistic. The enormous proportions which bill posting has assumed in the United States and the size of the posters hinder rather than aid artistic treatment. (See ADVERTISING.) For a long time the only artistic American posters were produced for the publishers in the form of enlarged magazine covers, as stated above, together with calendars and advertisements for books. They first became popular during the early nineties in designs of Edward Penfield, whose work has been the most significant and important in the development of the American poster, and Will H. Bradley, of *Chap Book* fame. Among others who distinguished themselves were Hasenpflug, Carqueville, J. J. Gould, Louis Rhead, Maxfield Parrish, Wildhack, the Leyendecker brothers, George Brehm, Adolph Treidler, A. G. Spear, and Walter Fawcett. The demand soon spread to other trades, such as collars, soaps, railroads, and automobiles. Strangely enough, theatres were almost the last to realize the importance of artistic advertising. Among artists who have within recent years distinguished themselves in theatrical posters are Henry Mayer, F. C. Cooper, Hamilton King, Blendon Campbell, Ernest Haskell, Clarence Tilt, and others. The American school now ranks among the best.

The criterion of a good poster differs vitally from that of other pictorial art. "It is an impression—a flash of line, a snap of color, all that can be told of a tale in the passing of an instant." To be effective it should be striking and simple. The most important technical feature is the design, then the colors, few and vivid. There should be only decorative, flat surfaces, no perspective or unnecessary detail. The fad for collecting posters, so prevalent in the nineties, has almost vanished, but their importance as an advertising medium is sure to grow with the increasing artistic taste of the nation. Although as a purely artistic production, a subject for collectors and students, the poster has had its day, yet as a medium of advertisement and of political appeal it may have a future.

Bibliography. The best work on posters, with fine illustrations and special treatment of American posters, is C. M. Price, *Posters: A Critical Study of the Development of Poster Design* (New York, 1913). Others are: Ernest Maindron, *Les affiches illustrées* (3 vols., Paris, 1895); Charles Hiatt, *Picture Posters* (London, 1895); Spielman and others, *The Modern Poster* (New York, 1895); J. L. Spousel, *Das moderne Plakat* (Dresden, 1897); G. H. E. Hawkins, *Poster Advertising* (Chicago, 1910). For fine illustrations, see Maindron, *Les maîtres de l'affiche* (Paris, 1896); id., *Les affiches étrangères illustrées* (ib., 1897).

POSTERN, pōs′tẽrn. In mediæval military architecture (q.v.), a small gate or door in the inclosing wall of the outer bailey, opening upon the country; hence any small or subsidiary door. Such a door for pedestrians at the side of a main gateway or carriage door in modern buildings of any sort is sometimes called a postern.

POST EXCHANGE. In the United States army, a name given in 1895 to the institution formerly known as the canteen (q.v.), the term "canteen" being, subsequently to this date, restricted to that part of the exchange in which the sale of beer and light wines was permitted. This feature was abolished by Act of Congress, Feb. 2, 1901. Post exchanges are established and maintained under special regulations issued by the War Department. They combine various elements, such as reading and recreation rooms, coöperative stores, and restaurants. In other words, post exchanges are, sales agencies apart, substantially soldiers' clubs. Whenever practicable they are housed in public buildings, either constructed or specially set apart for the purpose. The profits, if any, from the operation of post exchanges are returned to the various troop units of the garrison in the ratio of their strength, and are taken up in the company funds. Allotments may be made from post-exchange funds for the support of regimental and post athletics. An officer, known as the post-exchange officer, is detailed to conduct the affairs of the exchange. He has various assistants, who may be civilians, and is further assisted in matters of policy and of general administration by the post-exchange council, composed of himself, ex officio, and of the commanding officers of the units sharing in the activities of the exchange.

Bibliography. Chiefly government reports. Consult especially *United States Army Regulations;* and in respect of the canteen feature, *House Document 252* (Washington, 1903) and *Senate Document 133*, Fifty-seventh Congress, and *Senate Document 527*, Fifty-ninth Congress.

POST′GATE, John Percival (1853–). An English classical scholar, born at Birmingham. He was educated at Trinity College, Cambridge, where he was classical lecturer from 1884 until his appointment, in 1909, as professor of Latin in the University of Liverpool. From 1880, and while teaching at Cambridge, he also held the chair of comparative philology in University College, London. In 1899–1907 Postgate edited the *Classical Review* and in 1907–10 the *Classical Quarterly*. His publications include editions of Catullus, Propertius, Manilius, and Lucan, Book vii. In 1893 he became editor-in-chief of the *Corpus Poetarum Latinorum*. He also translated Tibullus for the Loeb Classical Library (1913).

POSTHUMOUS (pŏst′ŭ̇-mŭs) **CHILD** (Lat. *postumus*, *posthumus*, last, superlative of *posterus*, later; associated by popular etymology with *post*, behind, after + *humus*, ground). One born after the father's death, or delivered from the mother by the Cæsarean operation after her death. Such a child is regarded by the law, for the purposes of inheritance and taking property by will, as if it had been born before the parent's death. Where a father makes a will without making provision for a posthumous child, the child is entitled to receive the same share of the estate that he would have taken if the father had died intestate, the will being revoked *pro tanto* and the provisions for the other children or legatees being reduced proportionately to make up his share or portion. See Succession; Will.

POSTHUMUS, pŏst′ŭ̇-mŭs. The husband of Imogen, in Shakespeare's *Cymbeline*.

POST′HYPNOT′IC SUGGESTION. See Hypnotism.

POSTILLON DE LONGJUMEAU, Le, l*e* pō̇s′tė̃′yôɴ′ d*e* lôɴg′zhụ′mō̇′. An opera by Adam (q.v.), first produced in Paris, Oct. 13, 1836.

POST-IMPRESSIONISM. In art, the development following impressionism, a term applied to various radical movements in painting and sculpture. They represent in common a reaction against the nineteenth century—against realism, the painting of things, and impressionism, the painting of light. Generally speaking, they endeavor to paint pure feeling, disassociated from representation of natural objects, in a purely abstract language of form and color. The resemblance to nature is arbitrary, in fact there is often none whatever. The pioneer of the movement was Cézanne (q.v.) in his revolt against the flat surfaces of impressionism and emphasis of the permanent as distinct from the momentary appearance of things. Other early leaders were Van Gogh, Gauguin, and Matisse (qq.v.).

Cubism is the term applied to painting in geometrical forms and lines. The founder and leading exponent of the movement is the Spanish sculptor and painter Picasso (q.v.). Others are George Braque, Jean Metzinger, Albert Gleizes, Francis Picabia, Marcel Duchamp, and Fernand Leger. Their first collective exhibition was held in Paris in 1911.

Futurism originated in Italy about 1909, the first collective exhibition being held in Paris in 1912. The founder of the school was Marinetti, a writer. The Futurists are the anarchists of art. They render what they call the dynamic sensation or the interior force of an object, i.e., its rhythm, inclination, movement, and its conflict with neighboring objects in lines and planes. Among the principal representatives are the painters Boccioni, also a sculptor, Carrà, Russolo, Balla, and Severini.

The German Post-Impressionists cling more closely to the old masters, are more imaginative, and maintain a certain beauty of decorative color. They are most powerful in Munich, where they include a strong Russian element—Jawlensky, Kandinsky, Kubin Werefkin, and Burljuk—besides Erbsloh, Kanoldt, Franz Marc, Otto Fischer, Gabrielle Fischer, and other Germans. In England Post-Impressionism is represented by the sculptors Eric Gill and Jacob Epstein (q.v.), by Augustus John (q.v.), and by the very able painter-critic Roger E. Fry (q.v.). The modern movements were first introduced to the general public of the United States in exhibitions held at New York and Chicago in 1913 by the International Association of American Sculptors and Painters. Adherents to the new movement were won among the younger men. Except in the case of Arthur Dove, American cubism, however, was not thoroughgoing; witness the productions of Arthur Davies and H. G. Dearth.

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POSTL, pŏs′t'l, KARL. See SEALSFIELD, CHARLES.

POST MORTEM (Lat., after death). A legal term employed to denote an examination of a dead body to determine the cause of death. Usually some dissection or mutilation of the body is necessary, but this rests in the discretion of the examining physician. A coroner is required to hold a *post-mortem* examination of the body of a person dying under suspicious circumstances. Consult Sidney Perley, *Mortuary Law* (Boston, 1896). See AUTOPSY.

POST-MORTEM RIGIDITY. See RIGOR MORTIS.

POST-NASAL VEGETATION. See ADENOID, ADENOIDS.

POST-NUPTIAL CONTRACT. In its broadest sense, any contract made between husband and wife. As to their privileges and restrictions in this respect, see CONTRACT; HUSBAND AND WIFE.

POST OFFICE. A public institution for the reception and delivery of letters, newspapers, books, and such other matter as may by law of the state be intrusted to the mails for conveyance. The post office is frequently also charged with other duties than the handling of mail. Thus it issues money orders designed to facilitate the transmission of money, it conducts savings institutions, and in European countries it has a monopoly of the facilities for telegraphic communication. The postal service is at present in all civilized countries under the management and control of the government. The name originated in the posts (from Lat. *positum*, placed, fixed) placed at intervals along the roads of the Roman Empire where couriers were kept in readiness to bear dispatches and intelligence. The first letter post seems to have been established in the Hanse towns in the early part of the thirteenth century as a means of facilitating commercial intercourse. In England a system of posts for dispatching letters was early provided, Sir Brian Tuke being mentioned as the first Master of the Posts in the reign of Henry VIII. In the reign of Elizabeth a chief postmastership was established, Thomas Randolph being the first incumbent. With the accession of James I to the throne of England and the consequent increased intercourse between England and Scotland a marked improvement in the postal system followed. In the reign of Charles I a monopoly of letter carrying was established, the rates of postage being fixed at from 2d. to 6d. for a single letter, according to distance, in England, 8d. to Scotland, and 9d. to Ireland. In 1680 a penny post was established for the conveyance of letters and parcels between different parts of London and its suburbs. In the reign of Anne the existing postal statutes were repealed and the post-office establishment placed on a new basis. A general post office was instituted at London for the British dominions, with chief offices at Edinburgh, Dublin, New York, and other places in America, while the whole system was placed under the control of a postmaster-general with power to appoint deputies for the chief offices. Near the end of the eighteenth century coaches were substituted for riders on horseback. With the development of the railway system came the carriage of letters by train instead of by mail coaches.

In 1812 the rates of postage on letters were fixed at 4d. for 15 miles, with a regular increase up to 17d., which was the charge for any distance over 700 miles. In 1837 a plan of post-office reform was suggested by Mr. (afterward Sir) Rowland Hill, the adoption of which not only immensely increased the utility of the post office, but changed its whole administration. Its principal features were the adoption of a uniform and low rate of postage, a charge by weight, and prepayment. The new system came into full operation in 1840. A penny was adopted as the uniform rate for every inland letter not above half an ounce in weight. Facilities for prepayment were afforded by the introduction of postage stamps, and double postage was levied on letters not prepaid. Arrangements were made for the registration of letters, and the money-order office, by a reduction of the commission charged for orders, became available to an extent which it had never been before. Since 1897 the rates have been as follows when prepaid: not exceeding 4 ounces, 1d.; over 4 ounces and not exceeding 6 ounces, 1½d.; over 6 ounces and not exceeding 8 ounces, 2d., and so on at the rate of ½d. for every additional 2 ounces. A letter posted unpaid is charged double postage. Letters insufficiently stamped are charged double the deficiency on delivery. Redirected letters are charged additional postage at the prepaid rate, and this may either be prepaid or charged on delivery. Letters for officers, soldiers, or seamen on actual service abroad are redirected without charge. The same privilege extends, with several restrictions, to such letters redirected at home. By paying ½d. extra, letters may be posted in the boxes attached to mail trains, in which sorting is performed.

The home and foreign mail-packet service was, in the seventeenth and eighteenth centuries, in the hands of the post-office authorities, but was removed to the Board of Admiralty, under whose control it remained till 1860, when it was again restored to the post office. Steam vessels were first used for conveying the mail in 1821, and in 1833 mail contracts were introduced, the first being with the Mona Steam Company to run steamers from Liverpool to Douglas in the Isle of Man.

In 1914 there were 24,447 post offices in the United Kingdom besides 49,651 road and pillar letter boxes. The total number of letters delivered during the year was 2,986,200,000, as against 1,097,000,000 in 1879. The total number of post cards, books, newspapers, and parcels delivered through the mails amounted to 2,074,200,000. The number of money orders issued was 16,167,000, with an aggregate value of £61,474,000. The number of postal orders amounted to 152,340,000, with an aggregate value of £53,106,000. The total receipts of the post office exclusive of the income from the telegraphic service was £21,928,311, while the expenditures were £15,286,244, leaving a balance of £6,642,244.

The postal service of the United Kingdom is now under the immediate control of the Postmaster-General, assisted by the chief secretary of the post office in London, a financial secretary, and four other secretaries. There are also chief officers in Edinburgh and Dublin, with secretarial and other departmental staffs. The Postmaster-General is a member of the Privy Council and sometimes a cabinet minister. He is the only officer connected with the department who leaves office on a change of ministry.

Postal Savings Banks. See under that heading.

Post-Office Insurance. The system of post-office insurance, first established by the English government through the Government Annuities Act of 1864, like the system of postal savings banks, was primarily intended for the promotion of habits of thrift among the working people. For many years the government had sold terminable annuities for one life, two lives, or a term of years, through the Commissioners for the Reduction of the National Debt. The Act of 1864, which went into effect April 17, 1865, provided for the sale of such annuities of any amount between £4 and £50 through the Post Office Department. It further authorized the Postmaster-General to insure the lives of persons between the ages of 16 and 60 inclusive for any amount between £20 and £100. But little advantage was taken of the provisions of the Act, only 6524 contracts for life insurance having been entered into up to 1882. In that year the Act now in force was passed. By its terms annuities, either immediate or deferred, are issued to persons not less than 5 years of age for any amount between £1 and £100. Insurance, either life or endowment, may be taken out by any person between the ages of 14 and 65 inclusive. The amount of the insurance may vary from £5 to £100. Insurance for £5 may be taken out on the lives of children from 8 to 13 years of age. Insurance for £25 or less may be issued without a medical examination, provided the insured presents other satisfactory evidence of good health. Such policies provide, however, that, if the insured dies within two years of the issuance of the policy, the beneficiary shall not receive the full amount of his policy. Premiums may be paid in a lump sum in advance or in installments. In 1896 new premium rates were established, somewhat lower than those before in force. The present rates are a little higher than those of the regular life-insurance companies, but on the whole somewhat lower than those of industrial companies.

The connection between the insurance department and the savings banks is the most characteristic feature of the institution. Every policy holder must be a depositor in the postal savings bank. He must deposit the full amount of his first premium, opening an account if he has not one already. Later premiums the Postmaster-General transfers from the deposits of the insured so long as they hold out, without notice from the insured. The insured may make his deposits in the bank at any time and in any amounts, subject only to the general regulations of the bank. In the same way payments to the insured, whether arising from annuities or from endowment-insurance policies, are first credited to his account on the books of the bank. Furthermore, the deposits in the bank, and the withdrawals from it, may be made at any one of the 13,000 postal savings banks in the country.

Telegraphs. An Act of 1870 empowered the post office to acquire the existing electric telegraphs, and the telegraphic communication of the country is now in the hands of the post office. As a result of governmental control the rates charged have been greatly reduced and the number of messages sent greatly increased. Since 1885 the charges have been ½d. per word, with a minimum charge of 6d. for each telegram. About 87,000,000 telegraphic messages were sent in the year ending March 31, 1914, about 10 times the number sent in 1870. The gross revenue was £3,126,281; working expenses, £4,153,343. By an Act of 1898 the Post Office Department was further authorized to assume control of the telephone service of the United Kingdom. The expenditures of the telephone service in 1914 were £5,728,121 and the receipts £6,627,663.

A fee of 2d.—in addition to the ordinary postage—prepaid in stamps, secures careful handling of any letter, newspaper, or book packet and renders its transmission more secure by enabling it to be traced from its receipt to its delivery. Letters may be registered for a fee of 2d. to any place in the British colonies and for various rates of charge to different foreign countries. Letters containing coin, if not registered, are treated as if they were and charged on delivery with a registration fee of 8d.; the same fee is charged on letters marked "Registered" and posted in the usual way instead of being given to a post-office servant. The registration fee of 2d. entitles the sender to compensation up to £5, a fee of 3d. £10, and so on up to £120. There is a railway and express letter service by which letters may be intrusted to the railroad companies for dispatch upon payment of an additional fee.

Newspaper, Book, and Parcels Post. Newspapers and books may be sent through the mails at the rate of ½d. for every 2 ounces or fraction of 2 ounces. Newspapers to come under the definition must be published at intervals not exceeding seven days and appear in unstitched sheets. Under book post are included manuscripts, maps, prints, and circulars. In 1914 the number of newspapers carried aggregated 158,500,000, and the number of book packets, circulars, etc., was 1,000,200,000. The parcels post was established in 1883. In 1897 the rates were made 3d. for parcels not exceeding 1 pound, and 1d. for each succeeding pound up to 10 pounds. During the fiscal year ending March 31, 1914, 113,200,000 parcels were carried.

Free Delivery. Prior to the American Revolution no provision had been made for free delivery except in a few of the larger cities and towns. Since then the free-delivery system has become universal throughout the Kingdom. Corresponding to the American special delivery is the express-delivery service of the British post office, by which letters are sent out by express messengers in advance of the postman. Rural free-delivery service has been extended to all parts of England and is almost completed in Scotland and Ireland.

Money Orders. As far back as 1792 a money-order office as a private venture had been established for the transmission of small sums of money to different parts of the Kingdom. By an Act passed in 1838 this business was incorporated in the Post Office Department, but the commission charged was so high that it was only employed to a very limited extent. Inland money orders may be obtained at any of the post offices of the United Kingdom on payment of the following commission: for orders not exceeding £3, 3d.; over £3 and not exceeding £10, 4d. Money orders may now be issued to the colonies, to most European countries, the United States, Egypt, etc., the commission being about three to four times the above rate. A money order in the United Kingdom becomes void if not presented for payment before the end of the twelfth calendar month after that in which it was issued. Orders drawn on France or Italy must be paid within three months. The lower rates for inland money orders entail a loss on each transaction. Provision was further made for the issue of 10 classes of postal notes for small fixed sums, under the Post Office Bill of 1880.

Universal Postal Union. In October, 1874, a conference of representatives from all the states of Europe, the United States, and Egypt was held at Bern and resulted in the establishment of an international postal union with a central office at Bern, which meets every three years to consider questions affecting the postal relations of the states concerned. This was followed in June, 1878, by the Treaty of Paris, signed or subsequently adhered to by all the parties to the former treaty, with the addition of British India, the colonies of France, Spain, Holland, and Portugal, various British colonies, Persia, Japan, Liberia, Brazil, Peru, Mexico, in fact every country in the world except China, the new convention receiving the name of the Universal Postal Union. Under this important treaty all the consenting nations were declared to be "a single postal territory for the reciprocal exchange of correspondence." Instead of the varying rates theretofore prevailing, equal rates, weights, and rules were established, and considerable reduction of postage followed its adoption. Except in the case of lengthy sea transit, a uniform rate of 25 centimes (5 cents) was adopted for a letter of 15 grams (½ ounce); of 10 centimes (2 cents) for post cards; of 5 centimes (1 cent) for packets of print, etc., of 50 grams (2 ounces); and of 25 centimes (5 cents) for registration in Europe, and 50 centimes (10 cents) for registration beyond Europe. Prepayment of postage is required except on letters.

United States. In the English colonies of America before 1639 such postal facilities as existed were supplied by private enterprise. Letters from abroad were delivered at the wharf to those who called for them or sent to a near-by coffeehouse for distribution. In 1639 the General Court of Massachusetts took the first step towards the establishment of a government postal system by enacting the following decree: "It is ordered, that notice be given that Richard Fairbanks, his house in Boston, is the place appointed for all letters which are brought from beyond the seas, or are to be sent thither, to be left with him; and he is to take care that they are to be delivered or sent according to directions; and he shall be allowed for every letter a penny, and he must answer all miscarriages through his own neglect in this kind, provided that no man shall be compelled to bring his letters thither except he please." In Virginia each planter was required to convey the dispatches, as they arrived, to the next plantation, and so on. In 1672 the government of New York established a monthly mail to Boston. In 1683 and in 1693 post offices were established in Pennsylvania and New Hampshire respectively. In 1692 the Legislature of Virginia passed an Act reciting that one Thomas Neale had been empowered by letters patent from William and Mary to take charge of the postal business of the Colonies. Neale's patent authorized him "to erect, settle, and establish offices in America for the receiving and dispatching away of letters and packquettes" and to appoint the necessary persons to assist him. This patent created for the first time an American intercolonial postal service. In general its charges for carrying a letter ranged from 4d. to 15d., according to distance.

No man in America was so identified with the interests of the Colonial post office as Benjamin Franklin. In 1737 he was appointed postmaster of Philadelphia. In 1753 he received with William Hunter a royal commission as Deputy Postmaster-General for the Colonies. Franklin immediately proceeded to systematize the department and personally made a tour of inspection, in which he visited every post office in the country except that of Charleston, S. C. After four years of his administration the post office yielded the salary of the postmasters and a small revenue besides and in 1774 a clear annual revenue of £3000 to Great Britain. In 1753 the delivery of letters by the penny post was begun and also the practice of advertising letters remaining in the office in Philadelphia. In 1774 Franklin became obnoxious to the British government on account of his connection with the petition for the removal of Governor Hutchinson from Massachusetts, and on January 31 of that year he was dismissed from the deputy postmaster-generalship. By this time the patriotic movement which concluded in the Revolution was in full tide, and so great was the feeling caused by Franklin's dismissal that private arrangements were made for carrying letters, and after 1774 the American post office never again contributed a farthing to the British treasury. In fact, in 1775 the Colonies combined to establish their own post offices and to pay the necessary officials, the Continental Congress appointing a committee to devise a postal system, which went into effect July 26, 1775, when Benjamin Franklin was unanimously appointed Postmaster-General, with authority to establish a line of posts from Falmouth, Me., to Savannah, Ga., and as many cross posts as might seem to him necessary. In 1792 rates of postage were fixed which remained unaltered for nearly half a century. They were: for 30 miles and under, 6 cents; over 30 miles and not exceeding 60 miles, 8 cents; over 60 and not exceeding 100 miles, 10 cents; and so on up to 450 miles and over, for which the charge was 25 cents. In 1845 the rates were lowered, and a scale based on weight as well as distance was adopted. The postage on letters not exceeding ½ ounce in weight was fixed at 5 cents for any distance not exceeding 300 miles; over 300 miles it was 10 cents, with an increase of rate for every additional half ounce in weight. The rate on newspapers was nothing for distances under 30 miles; for over 30 miles and under 100, 1 cent was charged; over 100 miles, if beyond the borders of the State, the charge was 1½ cents. In 1851 the rate on letters not exceeding ½ ounce in weight was reduced to 3 cents for distances under 3000 miles and 6 cents for distances above 3000 miles. If not prepaid the rates were 5 and 12 cents respectively. Prior to 1851 no reduction was made for prepayment of postage. In 1855 a law was passed requiring prepayment, and this has continued to be the rule. In 1863 the element of distance as a factor in fixing the scale of rates was abolished, and a uniform rate of 3 cents was established for letters not exceeding ½ ounce in weight. In 1883 this rate was reduced to 2 cents.

Stamps. In 1847 adhesive postage stamps were first introduced into the United States, but, on account of the high rate of postage and the provision allowing optional prepayment, they did not come into general use until 1855, when the rates were reduced and prepayment required. In 1852 stamped envelopes were introduced, and in 1872 postal cards were authorized. In 1879 double or reply postal cards were authorized, and in 1898 private mailing cards were allowed to be sent through the mails at the rate of 1 cent postage, subject to certain restrictions prescribed by the Postmaster-General.

Classification of Mail Matter. Domestic mail matter is arranged into four classes. The first class includes letters, postal cards, and all matter wholly or partly in writing, whether sealed or unsealed (except manuscript and corrected proof). The rate on all matter of this class is 2 cents an ounce or fraction thereof. On postal cards it is 1 cent each, the price for which they are sold. On drop letters the rate is 2 cents an ounce at free-delivery offices and 1 cent elsewhere. The rule is prepayment except where the amount of the postage exceeds 2 cents, in which case if the weight does not exceed 4 pounds the excess of 2 cents may be called for from the addressee. Second-class matter includes newspapers and other periodical publications issued as often as four times a year, which bear a date of issue and are numbered consecutively and issue from a known office of publication and which are in the form of printed sheets without substantial binding. The rate of postage on second-class matter when sent by the publisher from the office of publication, or by a news agency to actual subscribers or to other news agents, is 1 cent a pound or fraction thereof. To actual subscribers within the county in which the paper is published postage is free except at free-delivery offices. To all other persons than publishers and newsdealers the rate of postage on second-class matter is 1 cent for 4 ounces or fraction thereof to any place in the United States, Porto Rico, Guam, Philippine Islands, Canada, and Mexico. Third-class matter includes miscellaneous printed matter (not books) weighing under 4 pounds, proof sheets, corrected proof sheets, and manuscript copy accompanying the same. All other mailable matter is included in the fourth class, or parcels post. In this class, except for parcels under 4 ounces and in case of books, seeds, cuttings, etc., under 8 ounces, rates are determined according to a zone system. There are eight zones, but for purposes of rate making the first two are treated as one. The weight limit for parcels in the first and second zones is 50 pounds; for longer distances, 20 pounds. Rates are subject to change by order of the Postmaster-General; the principle on which they are based is a combination of fixed terminal and varying distance charges.

Registered Letters. By an Act of 1855 provision was made for a system of registration by which extra precaution is taken in the transmission of valuable letters and parcels upon payment of a fee of 8 cents in addition to the regular postage. The postal officials take special care of such letters, but the government, until recently, refused to assume responsibility for such letters when lost. By an Act of 1897, however, provision was made for indemnifying persons who lose registered letters and parcels of value, but the limit of indemnity is $25 on third-class matter and $50 on first-class matter, but in no case in excess of the actual value of the article insured.

Money Orders. In 1864 the postal money order system was adopted, by which one is enabled to transmit money through the mails by making a deposit of the amount with the postmaster and receiving an order on the postmaster of the place to which the money is to be sent. No single money order for more than $100 may be issued. The fees charged range from 5 to 30 cents, according to the amount sent. For international money orders the fees range from 10 cents to $1.

Free Delivery. The system of delivering mail by carriers at the houses and offices of persons to whom it is addressed was first introduced on a small scale in 1863. In 1865 free delivery was extended to all places having a population of 50,000 and such other places as in the opinion of the Postmaster-General might seem expedient. In 1873 the system was extended to all places of 20,000 inhabitants and over and in 1887 to cities of 10,000 inhabitants or whose postal receipts amounted to $10,000. Provision was also made in 1885 for special or immediate delivery of letters within certain limits upon the payment of a fee of 10 cents in the form of a special stamp (later, any stamps of 10-cent value). In 1896 an experiment of delivering mail to inhabitants of rural districts was tried. The results were so satisfactory that the system has been largely extended. In 1914 there were 43,652 established free-delivery routes in the United States.

Franking Privilege. The privilege of sending and receiving mail free of postage was once enjoyed by the President of the United States, Vice President, heads of departments, Senators and Representatives, and other officials of the government during their official terms. For a time the privilege was conferred on all ex-presidents and widows of ex-presidents. By an Act of 1873 this privilege was abolished, but by later acts it was conferred on all officers of the government in the case of official correspondence. In 1895 the privilege was voted to members of Congress for their official correspondence.

Growth of the Postal System. The growth of the postal business in its various branches has been almost phenomenal. The table on page 117 shows by regular periods the increase in the number of offices, receipts, and expenditures from 1792 to the present.

The largest items of expenditure were for transportation of the mails on railroads, compensation of postmasters, free-delivery service, compensation of clerks, and transportation of the mails on the star routes. Of the post offices in operation in 1914, 8646 were presidential and 48,164 fourth class offices. First-class postmasters head offices with gross receipts of $40,-

000 and upward; second-class, offices with receipts of $8000 to $35,000; third-class, offices with receipts of $1900 to $7000. In the first grade salaries range from $3000 to $8000; in the second, $2000 to $2900; in the third, $1000 to $1900. Postmasters of these three grades are appointed by the President and confirmed by the Senate. By an executive order of May 7, 1913, fourth-class postmasters were put under the classified service.

YEAR	Number of offices	Receipts	Expenditures
1792	195	$67,443	$54,530
1802	1,114	327,044	269,866
1812	2,610	649,208	540,165
1822	4,709	1.117,490	1,167,572
1832	9,205	2,258,570	2,266,171
1842	13,733	4,546,849	5,674,752
1852	20,901	6,925,971	7,108,459
1862	28,875	8,299,812	11,125,364
1872	31,863	21,915,426	26,658,192
1882	46,231	41,883,005	40,482,021
1892	67,119	70,930,475	76,980,846
1905	68,131	152,826,585	167,399,169
1914	56,810	287,934,565	283,543,769

Bibliography. W. Lewins, *Her Majesty's Mails* (London, 1864); H. Joyce, *History of the Post-Office* (ib., 1893); Marshall Cushing, *Story of our Post-Office* (Boston, 1893); J. C. Hemmeon, *History of the British Post Office* (Cambridge, Mass., 1912); Wolfgang Riepl, *Das Nachrichtenwesen des Altertums* (Leipzig, 1913); *United States Official Postal Guide* (Albany, annually); E. W. Bullinger, *Postal and Shipping Guide* (New York, annually); *Annual Reports of the Postmaster-General* (Washington); also *British Postal Guide and Post Office Handbook* (London, annually). See FRANKING PRIVILEGE; POSTAGE STAMPS.

POST-TERTIARY PERIOD. The same as Pleistocene period (q.v.).

POSTULATE. See AXIOM.

POSTU'MIUS, SPURIUS. See CAUDINE FORKS.

POTASH. See POTASSIUM; SODA.

POTASHES. See PEARLASH.

POTASH SALTS. See POTASSIUM.

POTAS'SIUM (Neo-Lat., from *potassa*, potash, from Eng. *potash*, from *pot* + *ash*). A metallic chemical element first isolated by Sir Humphry Davy in 1807. The carbonates of potassium and of sodium, undistinguished from each other, were called alkali by the alchemist Geber, and they were known as fixed alkali in order to distinguish them from ammonium carbonate, known as the volatile alkali. Duhamel, in 1736, discovered that the alkali contained in common salt is different from that contained in the ashes of land plants, and thenceforth the first named was called mineral alkali and the second vegetable alkali. In 1758 Marggraf showed that the salts of the common alkali gave a violet tinge to the flame of a spirit lamp, while those derived from common salt showed a yellow color. Klaproth next pointed out that the vegetable alkali was contained also in several minerals, such as leucite, subsequent to which the special name of potash was applied to this alkali, and that of natron or soda to the mineral alkali. Both of these alkalies remained undecomposed up to the time of Davy's experiments, although their compound nature had been suspected by Lavoisier. (See CHEMISTRY.) Davy decomposed potassium hydroxide by passing the electric current from a voltaic pile of 200 plates through a piece of the hydroxide placed in a platinum dish.

Potassium is not found native, but is widely distributed, in combination, especially as the chloride and sulphate, in sea water and other natural waters; also as a constituent of many silicates, as the feldspars and micas, forming from 1.7 to 3.1 per cent of the granite composing the earth's solid crust. As sylvite (potassium chloride) and as carnallite (potassium and magnesium chloride) it occurs in the beds overlying the salt deposits of Stassfurt, Germany; and as nitre or the nitrate it is found as an efflorescence on the soil, usually with the sodium salt, in Chile, Peru, etc.; also as alunite (hydrous sulphate of potassium and aluminium), occurring in the older rocks, where its formation is attributed to the action of sulphurous gases. It is found as bitartrate in wines and as sulphate, carbonate, and chloride in molasses from beets. As chloride and carbonate, or as an organic salt, it occurs in soils and in vegetable and animal substances; wood ashes and the ash of marine plants contain much potassium carbonate. The suint from the wool of sheep contains a large proportion, sometimes as much as one-third, of an organic potassium salt which is separated as carbonate, together with the wool fat.

The most remarkable potash deposits are those found at Stassfurt, Prussia, where layers of potash and magnesia salts are found overlying the rock salt. The potash industry based on these assumed large proportions, but in addition other deposits have been discovered in Hanover, South Harz Mountain, and west Alsace. Small, partly developed deposits exist near Kaluz in Galicia, and about 1912 others were discovered near Sauria, Spain, and may in time become important producers.

The United States not only has been dependent on Germany, but has taken a large portion of its product, and its dependence on that country became keenly recognized during the German-American potash war of 1909–10.

The search for potash in the United States has drawn attention to the following possible sources: 1. Artificial brines from salt wells. Natural brines and rock-salt deposits contain from perhaps 2 to 11 parts per million of potassium, but this is not sufficient to be of commercial importance. 2. Saline lake beds, representing the site of former lakes the waters of which have disappeared by evaporation. These are common in the great basin region of the West; and since many of these lakes were saline, the presumption is that as the water evaporated the dissolved salts would be left behind, either as a surface crust or absorbed by the sediments of the lake bottom. Search over many of these areas and test borings had not in 1915 brought to light any important deposits of potash, with one exception, viz., Searles Lake, of California. In this dry lake basin there is a central area varying from 60 to 100 feet in thickness, consisting of a crystallized mass of sodium and potassium compounds immersed in strong brine. It is estimated that the 20,000 gallons of brine to be pumped daily from this deposit will yield 225 tons borax, 508 tons sodium carbonate, 1507 tons salt, 593 tons sodium sulphate, and 489 tons potassium chloride. 3. Alunite, $KAl_3(OH)_6(SO_4)_2$, may serve as a source of potash, if occurring in sufficient quantities, but the deposits thus far found in Colorado, Nevada, and Arizona are of insufficient size. 4. Igneous rocks frequently contain a considerable quantity of the potash feldspar, orthoclase, and in some cases the silicate of potash, leucite, but the value of these rocks as a source of potash depends on a commercially practicable process of extraction. 5. Feldspar veins. These are common in some regions, but the total quantity available from such a source would not be large.

The original electrolytic method used by Davy for the preparation of metallic potassium has already been referred to. It was soon superseded by methods that had for their purpose the reduction of the carbonate by means of carbon; thus an intimate mixture of potassium carbonate with charcoal, obtained by igniting crude acid potassium tartrate in an iron crucible, yielded a porous mass which was heated to a white heat in an iron bottle connected with a receiver, into which the potassium distilled over and was condensed. The process now generally used is virtually the one invented by Castner, and consists in reducing a potassium salt, such as the hydrate, by a mixture of carbon and a metallic carbide, or a mixture of very finely divided metal and carbon, which is heated in an iron crucible with an exit tube passing through the lid. The potassium distills over into the receiver and at the end of the operation is placed under petroleum so as to prevent oxidation.

Potassium (symbol, K; atomic weight, 39.1) has, when freshly cut, a bright silvery metallic lustre and a specific gravity of 0.875 at 13° C. (55.4° F.), being lighter than any other metal except lithium. It is brittle at 0° C. (32° F.) and possesses a crystalline fracture; at 15° C. (59° F.) it becomes soft like wax, and it melts at 62.5° C. (144.5° F.), forming a liquid that closely resembles mercury in appearance. With the exception of cæsium and rubidium, it is the most electropositive element known, and it acts as a powerful reducing agent. On exposure to the air it rapidly becomes converted into the hydrate and finally into the carbonate. It decomposes water with sufficient energy to ignite the liberated hydrogen. When brought into contact with the halogens and with sulphur, selenium, tellurium, and phosphorus, it unites with them. It also alloys with most metals, usually by being heated with them, and with sodium it forms an alloy which, unlike either sodium or potassium, is liquid at ordinary temperatures. For commercial purposes its use, especially as a reducing agent, has been almost entirely superseded by that of sodium, owing to the cheapness of the latter.

With oxygen potassium combines to form two oxides, a monoxide (K_2O) and a peroxide (K_2O_2). The former is formed when potassium hydrate is heated with metallic potassium; it is a gray, brittle mass that has strong basic properties. When dissolved in water this oxide forms potassium hydroxide (KOH), or caustic potash, which, however, is usually prepared commercially by decomposing a dilute solution of potassium carbonate with slaked lime. *Potassium hydroxide* is a hard, white, brittle, powerfully caustic substance, quickly destroying many animal and vegetable substances; it finds extensive use in the manufacture of soap. *Potassium peroxide* is formed when metallic potassium is burned in the air. *Potassium arsenate*, called also Macquer's salt, is used in calico printing for the purpose of fixing the mordant on the fibre of the material. *Potassium bromide* may be made by decomposing iron bromide with potassium carbonate, and allowing the resulting liquid to crystallize. Potassium bromide crystallizes in the form of white cubes that have a strong saline taste and find extensive application in photography and medicine. *Potassium carbonate*, which was known to the ancients and is described by Aristotle as being prepared by the burning of rushes, was long obtained by burning plants in dry pits and dissolving the ashes in water, then evaporating till the sulphates, chlorides, etc., separated out by crystallization, and then boiling the mother liquor to dryness in iron pots, which was probably the origin of the name "potashes." The process subsequently introduced was similar to that used by Le Blanc for the manufacture of soda ash, and consisted in fusing potassium sulphate with calcium carbonate and coal. This salt, which is a white solid with an alkaline and caustic taste, is used largely in the manufacture of soft soap, glass, potassium chromate, and potassium ferrocyanide. *Potassium chloride*, known commercially as *muriate of potash*, is largely obtained from the Stassfurt deposits, where it occurs native as sylvite and in combination with magnesium chloride as carnallite. The last named is the principal source. The crude mineral, which contains 60 to 70 per cent of true carnallite ($KCl \cdot MgCl_2 \cdot 6H_2O$), is decomposed in a solution of magnesium chloride and common salt. Potassium chloride is a white crystalline compound with a strong saline taste. It is used chiefly in the preparation of other potassium salts, such as the carbonate and the chlorate, and in an impure state it is employed as a fertilizer. *Potassium bichromate* is prepared by heating together finely ground chromic iron ore with potassium carbonate and lime. The resulting mass is extracted with hot water and the calcium chromate precipitated out by means of potassium sulphate, leaving in solution potassium chromate, which is then converted into the bichromate by treatment with sulphuric acid. The resulting solution is evaporated to crystallization, yielding splendid garnet-red crystals. Potassium bichromate finds extensive use in the preparation of chromium (q.v.) compounds, in the manufacture of various colors, as an oxidizing agent, and in certain photo-engraving processes, owing to the fact that when mixed with gelatin it becomes insoluble when exposed to the light. This particular property has also led to its employment in the manufacture of insoluble glue. *Potassium cyanide* may be prepared by melting potassium ferrocyanide with potassium carbonate in an iron crucible. It is a white crystalline compound, exceedingly poisonous. It finds some use in photography and as a reducing agent in chemical operations, especially in metallurgy. (See HYDROCYANIC ACID.) *Potassium iodide* may be prepared by decomposing ferrous iodide with potassium carbonate, evaporating, dissolving the resulting mass, and crystallizing. This salt crystallizes in white cubes that have a sharp taste, and is used chiefly in photography and in medicine. *Potassium nitrate*, which is found native as nitre, or saltpetre, is described under SALTPETRE. *Potassium silicate* is prepared by heating potassium carbonate with white sand in a reverberatory furnace, usually with a small amount of charcoal, by means of which a compound is obtained that is put on the market as a thick solution, and is used as a substitute for sodium silicate in the manufacture of soaps and in fresco painting. (See WATER GLASS.) *Potassium sulphate* is found in large quantities at Stassfurt, principally as kainite, which is a potassium and magnesium sulphate with magnesium chloride. It is a crystalline salt with a bitter saline taste and finds use in medicine as a purgative, while large quantities are used for the manufacture of potash alum and potassium carbonate. It was formerly called sal polychrest. The acid sulphate, or bisulphate, the sal enixum of the older chemists, may be formed by heating potassium sulphate with sulphuric acid or by heating potassium nitrate with sulphuric acid. It is a white crystalline compound, occasionally used as a flux. Other potassium salts may be found described under the names of the acids contained in them.

Physiologically the potassium salts are protoplasmic poisons when applied locally in concentrated solutions. Caustic potash, e.g. (potassium hydroxide, KHO), is used to destroy warts and similar new growths. In large doses by the mouth the potassium salts are gastro-intestinal irritants, and as compared with the salts of sodium are depressing to the circulation. Other potassium compounds used in medicine are the dichromate, an antiseptic and escharotic; Fowler's solution, a preparation of arsenic (q.v.) and a favorite medium for prescribing that drug; the acetate ($KC_2H_3O_2$), carbonate (K_2CO_3), bicarbonate ($KHCO_3$), bitartrate ($KHC_4H_4O_6$), and sulphate (K_2SO_4), diuretic and laxative; potassium citrate ($K_3C_6H_5O_7H_2O$), a diuretic and febrifuge. Potassium bromide (KBr), potassium hypophosphite, and potassium iodide (KI), are among the most useful drugs we possess; the popular Seidlitz powder (q.v.) contains potassium bitartrate, sodium bicarbonate, and tartaric acid; Rochelle salt is potassium and sodium tartrate, much used as a saline purgative; potassium ferrocyanide is used chiefly in industrial processes; potassium permanganate is a powerful disinfectant; potassium nitrate (KNO_3) is saltpetre, or nitre; potassium chlorate is a useful mouth disinfectant and almost a specific in stomatitis (q.v.); potassium cyanide (KCN; see HYDROCYANIC ACID) is one of the most active poisons known. The value of the potassium salts imported into the United States in 1913 was $10,793,913.

Bibliography. G. Lunge, *A Theoretical and Practical Treatise on the Manufacture of Sulphuric Acid and Alkali* (2d ed., 3 vols., London, 1891); Lunge and Harter (eds.), *The Alkali-Maker's Handbook* (ib., 1891); Precht, *Die Salzindustrie von Stassfurt* (5th ed., Stassfurt, 1892); Pfeiffer, *Deutschlands Kaliindustrie* (1902); J. H. Van't Hoff, *Zur Bildung der ozeanischen Salzablagerungen* (2 vols., Brunswick, 1905–09). For alunite occurrence, see *United States Geological Survey, Bulletins 511, 530, 540;* Waggaman, *United States Department of Agriculture, Bureau of Soils, Circular 70* (1912). For potash in brines, see Turrentine, *Journal of Indian and English Chemistry*, vol. iv, pp. 828, 885 (1912), and vol. v, p. 19 (1913). For lake deposits, see Gale, *United States Geological Survey, Bulletin 530*, p. 295 (1913), and Young, *United States Department of Agriculture, Bulletin 61* (1914). For silicates, consult Cushman and Coggeshall, *Eighth International Congress of Applied Chemistry*, vol. v, p. 33 (1912); also Schultz, *United States Geological Survey, Bulletin 512* (1912).

POTASSIUM CYANIDE. See HYDROCYANIC ACID; POTASSIUM.

POTATO (from Sp. *patata*, white potato, *batata*, sweet potato, from Haitian *batata*, sweet potato). An important cultivated plant, raised in temperate climates for its esculent tubers. It is often called Irish potato because of its general cultivation and use in Ireland. It belongs to the family Solanaceæ, or nightshade family, which also includes tobacco, belladonna, tomato, egg plant, and pepper. The potato (*Solanum tuberosum*) is a native of the mountainous districts of tropical and subtropical America, from Chile to Mexico, a form of it occurring even as far north as southern Colorado. It is difficult, however, to determine where it is really indigenous and where it has been introduced by man. Like maize, it was cultivated and its tubers were used for food before the discovery of America. It seems to have been first brought to Europe from Peru by the Spaniards early in the sixteenth century and to have spread from Spain into Holland, Burgundy, and Italy, but only to be cultivated in a few gardens as a curiosity. In nearly all European countries it was called batata, by which name sweet potato is designated by English writers down to the middle of the seventeenth century. The data concerning its introduction into Europe are not very definite. It appears to have been brought to Ireland from Virginia by Hawkins, a slave trader, in 1565 and to England by Sir Francis Drake in 1585. Sir Walter Raleigh is said to have taken some tubers to England in 1586 and brought them to the attention of Queen Elizabeth. It was not until a long time after its introduction that the culture of the potato became general. Gerard in his *Herball*, published in 1597, described it under the name of *Batata virginiana*, but so little were its merits appreciated that it was not even mentioned in *The Complete Gardener*, a work published in 1719. At first it was regarded chiefly as a food for swine and cattle, but later it was thought that on account of its great yield it might be useful as food for poor people and for the prevention of famine due to failures of the grain crops. In accordance with this idea, the Royal Society of London in 1663 adopted measures for the extension of its culture. Its cultivation first became most general in Ireland, but it was not until about the middle of the eighteenth century that it acquired any real importance on the continent of Europe, and not until the end of that century did it become important as a field crop in Germany and France, which are to-day two of the greatest potato-producing countries of the world. In France the extension of potato culture was owing mainly to the efforts of Parmentier, a prominent agriculturist and economist. Historical data concerning the development of the potato as a crop in North America are even more meagre. In 1771 only a white and a red variety were mentioned in the most important English work on gardening, while to-day at some of the experiment stations in Europe and America tests are made of 150 to 200 varieties at one time. Apart from the abnormal development of the tubers and the very much reduced production of seed, it is believed that there have not been great changes in the potato plant since its cultivation became general.

Cultivation. The potato is a perennial plant, with smooth herbaceous stems from 1 to 3 feet high, pinnate leaves, and white or purple flowers about 1 inch wide, and producing a globular, purplish fruit or seed ball of the size of a gooseberry. (See Plate of VEGETABLES.) The tubers are distinct from the roots, being underground stems of considerable size even when the plant is in its native state; under the influence of cultivation they have become enlarged through the accumulation of starch for the use of the plants grown from the eyes, or buds. Owing to its wide distribution, from the cooler tropics to the cooler temperate zones, it is grown on a great variety of soils, but the soil best suited to the crop is a rich, sandy loam, well supplied with organic matter and well drained. It responds to liberal manuring, but, since a direct application often injures the quality of the tubers, barnyard manure is preferably applied the previous year; otherwise complete commercial fertilizers, containing nitrogen, phosphoric acid, and potash, are applied.

The land should be plowed as deeply as possible without turning up the subsoil. The tubers are usually planted in drills wide enough apart to admit of cultivation with the horse hoe or the cultivator and from 12 to 16 inches apart in the row. The pieces of the tuber used for planting, called sets, cuttings, or seed pieces, are covered about 4 inches deep. Planting is usually done by hand, but where the crop is grown on a large scale potato planters are used. The crop is planted in spring when danger of injury by frost has passed. After planting, the soil is harrowed frequently until the plants are all up, when the cultivator is used until the vines shade the ground. The results of experiments at different experiment stations in the United States indicate that the use of half the tuber as a seed piece is preferable to using smaller cuttings or the whole tuber. The total production of potatoes in the United States is about 350,000,000 bushels annually, and the average acre yields about 95 bushels.

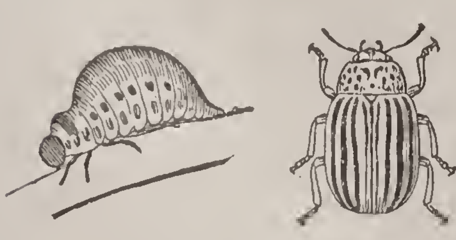
Potato Diseases. Until comparatively recently the potato blight or rot was believed to be all caused by a single fungus. Two distinct forms are now held accountable—the leaf or early blight, and the late blight or rot. The early blight (*Alternaria solani*) appears upon the leaves as grayish-brown spots, which, about the time the tubers are beginning to form, enlarge and in 10 days or two weeks involve half the leaf. In about a month all the foliage may have succumbed. The late blight or rot (*Phytophthora infestans*) appears in August or September, attacking leaves, stems, and tubers. The leaves are first to appear to be injured. They show brown or black areas, which soon become soft and foul-smelling. Moisture and a fairly warm but not hot temperature is most favorable to its rapid development, and a few dry hot days will check its spread. The tubers also become blotched or discolored on the surface and streaked within with brown or black. Since they are then likely to rot, the crop is virtually worthless. Both these diseases can be prevented by spraying with Bordeaux mixture, beginning when the plants are 4 to 6 inches high and continuing through the season at intervals of 10 days to 2 weeks. Brown rot, believed to be caused by *Bacillus solanacearum*, is sometimes troublesome in the Southern States. The foliage usually wilts, shrivels, and turns brown or black. Since leaf-eating insects are held accountable for the spread of this trouble, they are combated with insecticides. Rotation of crops is recommended as a means of prevention, and care in the selection of seed tubers that they do not come from infested regions. Scab (*Oospora scabies*, now called *Actinomyes chromogenus*) appears as rough, dark patches of varying depth upon the tubers, rendering them unsightly and destroying the outer portions. Scabby potatoes and infested soil should be avoided. Many growers soak the seed in a solution of 2½ ounces of corrosive sublimate in 15 gallons of water, or 8 fluid ounces of formalin, or formaldehyde, in 15 gallons of water, after which the tubers are spread to dry. These are considered preventive measures. Several potato diseases have become prominent within a few years, and on account of the presence of some of them in parts of Europe a quarantine was established by the United States against the importation of potatoes from those countries. The most serious of the diseases are the black wart, attributed to *Synchytrium* (*Chrysophlyctis*) *endobioticum*, which transforms the tubers into a black worthless mass, and the powdery scab caused by *Spongospora subterranea*, which forms deeper scabs than those described above, nearly or quite eating the tuber away. This disease has recently appeared in a number of places in the United States, but it has not proved so destructive as in Europe. Other little-known diseases are black leg, leaf curl, rosette, and wilt.

Food and Feeding Value. When a section of the potato is carefully examined, it will be seen to consist of three more or less well-defined portions, viz., the skin, cortical or fibrovascular layer, and the flesh, which is made up of the outer and inner medullary layers. The cortical layer, immediately beneath the true skin and sometimes designated the inner skin, is slightly colored, containing practically all the coloring matter normally present in the potato. As shown by recent analyses, the skin of the potato constitutes on an average 2.5 per cent of the whole, and the cortical layer 8.5 per cent. It is difficult to peel potatoes so that the skin only is removed. The amount of refuse and edible portion lost by peeling is estimated at 20 per cent. Doubtless in many cases the rejected portion is very much larger.

The edible portion is made up of 78.3 per cent water, 2.2 per cent protein (total nitrogenous matter), 0.1 per cent fat, 18.4 per cent carbohydrates (principally starch), and 1 per cent ash or mineral matter. Of the carbohydrates, 0.4 per cent is made up of crude fibre and materials which in some of their modifications constitute the cell walls of plants and give them a rigid structure. The fuel value is 385 calories per pound. The above figures, like others for composition of food materials, represent general averages, from which there are wide variations in individual specimens. Though the skin, cortical layer, and flesh differ somewhat in composition, they all resemble more or less closely that of the whole tuber. When potatoes are stored they shrink about 12 per cent in 7 months.

Although the potato contains some protein, it is chiefly valuable as a carbohydrate food, and, like all such food, is useful for supplying the body with energy. Just why cooking changes the flavor as it does has apparently never been determined with certainty. The physical condition of the potato is much affected by heat. In the raw potato the separate starch grains are inclosed in cells with walls composed of crude fibre, a material resistant to digestive juices. Heat expands the water present, ruptures the cells, and breaks up the starch, expanding the granules, which when raw consist of tightly packed concentric layers. Over 90 per cent of the total nutritive material of potatoes is digestible. According to statistics obtained in the large number of dietary studies made in the United States, potatoes constitute about 13.7 per cent of the total food consumed by the average family and furnish not far from 3.9 per cent of the total protein and 10 per cent of the total carbohydrates. The universality and extent of its consumption seem sufficient to prove it a wholesome and nutritious food. Scientific investigation shows that the practice, which has become so general, of serving potatoes with meat and other similar foods which contain liberal amounts of protein is based upon correct principles, one food supplying the deficiencies of the other.

Evaporated potatoes are on the market, being especially recommended for provisioning camps and expeditions. As compared with fresh, the evaporated potatoes have a high nutritive value in proportion to their weight. Large quantities of potatoes are used for the manufacture of starch. Potatoes either raw or cooked are sometimes fed to pigs, milch cows, and other farm animals. When fed to pigs it has been found that 4½ bushels of cooked potatoes (fed with corn meal) is equivalent to one bushel of corn. The world's production of potatoes is about 6 billion bushels annually, having increased nearly 50 per cent since 1900. Germany is the largest producer, her product in 1913 amounting to nearly 2 billion bushels. Russia produced, in 1913, 1½ billion bushels. Consult A. W. Gilbert, *The Potato* (New York, 1915); E. H. Grubb and W. S. Guilford, *The Potato* (ib., 1912); T. Remy, *Der Kartoffelbau* (Berlin, 1909); and publications of the United States Department of Agriculture and of State Agricultural Experiment stations.



COLORADO POTATO BUG AND ITS FEEDING LARVA.

POTATO INSECTS. The principal enemy of the common field potato (*Solanum tuberosum*) of the United States is the famous potato bug, or, more exactly, the Colorado potato beetle (*Dorophora decemlineata*). This insect, originally confined to the Rocky Mountain region, where it fed upon the sand bur (*Solanum rostratum*), readily attacked cultivated potatoes as soon as civilization advanced to its native region. In 1859 it had spread eastward and reached a point 100 miles west of Omaha; in 1861 it invaded Iowa; in 1864 and 1865 it crossed the Mississippi, reaching Illinois both from northern Missouri and Iowa; in 1867 it had crossed Illinois into western Indiana, and in 1869 had spread across the State and had made its way into Ohio, appearing almost simultaneously in the northern and southwestern portions; in July, 1870, it invaded the Province of Ontario; in 1872 it reached western New York and spread into Pennsylvania, and in 1873 had reached eastern New York and the District of Columbia; in 1874 the Atlantic Seaboard was gained at several points. Its southern spread was much more slow than in the North, and in 1871 it had not touched the extreme southern counties of Missouri. In fact, it was not until 1897 that it succeeded in establishing itself in portions of Mississippi and Georgia. Although accidentally introduced into Europe on several occasions, the species has not established itself outside of North America. The female beetles, which have overwintered beneath the surface of the ground or under any shelter, lay their eggs on young potato plants as soon as they appear above ground and will even work into the ground to feed on the young leaves before these have fairly shown themselves. The dark-reddish larvæ hatch in less than a week and reach full growth in from two to three weeks, after which they enter the earth to pupate, becoming beetles about a month after the time of hatching. There are three or four generations each year. This insect is readily controlled by the application of Paris green or some other arsenical poison, either as a spray or dusted dry upon the plants. The potato bug is destroyed also by the potato-bug enemy (*Lebia grandis*). See Colored Plate of INSECTS.

The potato crop is sometimes damaged by the so-called stalk borer (*Gortyna nitela*), an owlet moth which lays its eggs on the stalks not only of potato but also of tomato and of certain ornamental plants. The larva bores into the stalk and causes the plant to wilt. The potato-stalk weevil (*Trichobaris trinotatus*) is very common in the Mississippi valley. The bluish or ash-gray beetle deposits a single egg in a slit which she has made with her beak in the stalk of the potato. The larva bores into the heart of the stalk and proceeds downward towards the root, pupating within the stalk, issuing as an adult about the last of August. In both cases all wilting vines should be pulled and burned.

The tomato worm (*Sphinx 5-maculata*) also feeds occasionally upon potato, but is not an important enemy of this crop. Potatoes suffer, however, sometimes severely, from the attacks of blister beetles, and a leaf beetle called the three-lined potato beetle (*Lema trilineata*) occasionally damages the leaves. The cucumber flea beetle (*Haltica cucumeris*) also preys upon the leaves, as does one of the tortoise beetles.

Consult C. V. Riley, *Potato Pests* (New York, 1876), and J. B. Smith, *Manual of Economic Entomology* (Philadelphia, 1896).

POTATO ROT, SCAB, ETC. See MILDEW; POTATO, *Potato, Diseases;* PHYTOPHTHORA.

POTATO STONE. See GEODES.

POTAWATAMI, pŏt′â-wŏt′â-mĭ (properly *Potewatmik*, fire makers, in allusion to their traditional making of a separate council fire for themselves). A prominent Algonquian tribe, formerly holding the lower end of Lake Michigan, extending southward to the Wabash River and westward into central Illinois. They were closely related to the Ojibwa and Ottawa (qq.v.). When first known the Potawatami were settled about the mouth of Green Bay, Wis., and were early brought under the influence of the Jesuit mission established at that point. They were then moving southward and 30 years later had fixed themselves at Chicago and on the St. Joseph River, on former Miami territory. After the conquest of the Illinois (q.v.) about 1765 they took possession of a great part of Illinois as well as of lower Michigan. At the Greenville Treaty of 1795 they notified the Miami that they intended to move down the Wabash, which they soon afterward did, despite the protests of the Miami, who claimed the whole region. By the year 1800 they were in possession of the whole territory around Lake Michigan from Milwaukee River, Wis., to Grand River, Mich., with much of northern Indiana and Illinois.

They took part with the French in all the Colonial wars and were active also in the rising under Pontiac. They sided with England in the Revolution and, with the other tribes, continued the struggle until the Treaty of Greenville in 1795. In the War of 1812 they again took up arms, under Tecumseh, on the English side and later joined in the final treaty of peace in 1815. Under the systematic plan of removal soon after inaugurated by the government they sold their lands by successive treaties, so that by 1841 virtually the whole tribe had been transported beyond the Mississippi. A large part of those residing in Indiana refused to leave their homes until driven out by military force. Some escaped to Canada and are now settled on Walpole Island, in Lake St. Clair. Those who went west were settled, partly in Iowa and partly in Kansas, but in 1846 both bodies were united on a reservation in southern Kansas. In 1868 a part of these, known as Citizen Potawatami, were again removed to Oklahoma. A considerable part of the tribe is still in Wisconsin, and another small band known as Potawatami of Huron is in lower Michigan, in addition to the small band on Walpole Island, Ontario. The most reliable early estimates give them from 2500 to 3000 souls at their greatest strength. In 1915 they numbered about 2500 in all, viz., Citizen Potawatami, Oklahoma, 866; Prairie Band, Kansas, 819; Potawatami of Huron, Michigan, 461; Wisconsin, 245; scattered in Oklahoma, Indiana, etc., perhaps 49; Walpole Island and Aux Sables, Ontario, mixed Potawatami and Ojibwa, 150. Consult H. R. Schoolcraft, *Indian Tribes of the United States* (Philadelphia, 1851).

POT BOUILLE, pȯ bo͞o′y′. One of Zola's Rougon-Macquart series of novels (1883).

POTCHEFSTROOM, pŏch′ĕf-strōm. A gold-mining town in the southern part of the Transvaal Province, South Africa, 105 miles southwest of Pretoria (Map: Cape of Good Hope, H 6). Pop., 1911, 10,765, of whom 7053 were whites.

POTEKHIN, pȯt-yĕκ′ĭn, ALEXEI ANTIPOVITCH (1829–1908). A Russian dramatist and novelist. He was born at Kineshma (Government of Kostroma), studied at Yaroslav, saw some military service, and settled in St. Petersburg. His literary work began in 1852 with a comedy of provincial life. Then followed a series of novels and short stories dealing with peasants. As a novelist he is a Realist of much the same school as Pisemski and Grigorovitch (qq.v.), especially successful in his portrayal of dismal village life. His earlier dramas were slow in getting to the stage, having come under the ban of the censors for their attacks on existing conditions. They include: *Human Justice not Divine* (1853); *Ill-Gotten Gains Bring No Good* (1854); *Tinsel* (1858); *The Severed Limb* (1865); *A Vacant Place* (1870). His novels and tales of peasant life include: *The Poor Nobles* (1859), his best novel; *The Sick Woman* (1876); *Under the Spell of Money* (1876); *Before the Community* (1877); *Young Inclinations* (1879); *Village Vampires* (1880). A complete edition of his works, in 12 volumes, was published at St. Petersburg in 1903.

POTEM′KIN, *Russ. pron.* pŏt-ya̤m′kĭn, GREGOR ALEXANDROVITCH, PRINCE OF TAURIDA (1739–91). A Russian politician, born in the Government of Smolensk. In 1755 he became an ensign in the Imperial Horse Guards and took part in the conspiracy to dethrone Peter III in favor of Catharine II. This won him the favor of the Empress, and he was rewarded with 400 serfs and made an officer of the Imperial household, succeeding in time Orloff as the recognized favorite of the Empress. When, in his turn, he was superseded as a lover, he retained his ascendancy in affairs of state, being made general in chief of the army, field marshal, and governor of important provinces. As the principal representative of the Russian foreign policy, his influence was courted by the foreign rulers, and, in spite of a lack of the real gifts of statesmanship, he displayed a certain amount of skill in the conduct of affairs. He zealously furthered the process of southern expansion at the expense of the Turks, was instrumental in annexing the Crimea to Russia (1783), and for this service received the title of Prince of Taurida together with the governorship of the newly acquired territory. He devoted himself to the economic development of the southern provinces of Russia, founded the towns of Kherson, Kertch, Nikolaev, and Sebastopol, and strengthened Russia's power in the Black Sea. It is told, as an illustration of the methods by which he preserved the Imperial favor, that in 1787, when Catharine visited his government, he caused a large number of villages to be constructed along her route, with hirelings to play the part of contented peasants and well-fed citizens, all of which pleased her Majesty and brought Potemkin increased honors. He died near Nikolaev in Bessarabia during the course of Catharine's second war against the Turks, Oct. 16, 1791.

Consult: De Cerenville, *Vie du Prince Potemkin* (Paris, 1808); Saint-Jean (Potemkin's secretary), *Lebensbeschreibung des Gregor Alexandrovitsch Potemkin des Tauriers*, edited by Rothermel (Karlsruhe, 1888); and lives in Russian by Levshin (2 vols., St. Petersburg, 1808) and Alexander Brückner (Berlin, 1892); also *Cambridge Modern History*, vols. vi, viii (New York, 1904–09).

POTENT. The name of a fur used in heraldry (q.v.).

POTEN′TIAL (OF. *potential, potentiel*, Fr. *potentiel*, from Lat. *potentia*, power, from *posse*, to be able). A mathematical term used to express that property of a field of force (see FORCE) which determines in which direction motion will take place if there are no restraints. In an electrical field of force the potential at a point is defined as the work required to carry a particle with a unit positive charge up to that point from an infinite distance away. If left to itself a positive charge will, therefore, always move from points of high to those of low potentials. In a magnetic field of force, the potential at a point is defined as the work required to bring up from an infinite distance to that point a unit north pole. If free to move, a north pole of a magnet will move from points of high to those of low potential.

In a gravitational field of force the potential at a point is defined as the work required to carry a unit mass of matter from that point to an infinite distance. Portions of matter, if free to move, do so from points of low to those of high potential.

In the application of thermodynamics to chemical phenomena a potential is such a function of the variable qualities that for all allowable changes it has the lowest possible value—it is a minimum.

POTENTIAL ENERGY. See MECHANICS.

PO′TENTIL′LA (Neo-Lat., from Lat. *potens*, powerful; so called on account of properties ascribed to it in mediæval medicine), CINQUEFOIL. A genus of numerous species of mostly perennial herbs of the family Rosaceæ, widely distributed in the Northern Hemisphere. The genus differs from *Fragaria* (strawberry), which it otherwise resembles, in having dry instead of succulent receptacles of the fruit. The flowers are yellow, white, red, or purple, the leaves pinnate, digitate, or ternate. One species (*Potentilla fruticosa*), often planted in shrubberies, is abundant in North America from Pennsylvania to Iowa and northward, and forms a profusion of yellow flowers. *Potentilla anserina*, silverweed, a European species also common in America, has creeping stems, yellow flowers, beautiful silky and silvery leaves, and edible, parsnip-flavored roots, which are much relished by swine and were formerly used as human food.

SHRUBBY CINQUEFOIL
(*Potentilla fruticosa*).

POTENTITE. See EXPLOSIVES.

POTENZA, pō-tĕn′tsȧ. The capital of the Province of Potenza, Italy, situated on a hill near the Basento, 55 miles east of Salerno (Map: Italy, E 4). It is surrounded by a wall; it has a Doric cathedral, a Gymnasium, lyceum, a seminary, and an industrial school. The industries are the cultivation of the vine and the manufacture of bricks. Potenza has been largely rebuilt since the earthquake in 1857. Remains of several ancient cities, including Potentia, are in the vicinity. Pop. (commune), 1901, 16,186; 1911, 16,672.

POTGIETER, pŏt′gē-tẽr, EVERHARDUS JOHANNES (1808–75). A Dutch critic and poet, born at Zwolle. He was engaged in business in Antwerp for a time, then settled in Amsterdam, where he became one of the circle of younger authors, and in 1837 founded *De Gids*, in which he made himself a name by clever criticism and excellent fiction and verse. These papers were collected partly by himself (1864–69 and in many editions) and partly by Zimmermann (1875 et seq.). Potgieter's further works are: *Het Noorden in omtrekken en tafereelen* (1836–40); *Liedekens van Bontekoe* (1840); a poem, *Florence* (1868), his masterpiece, though obscure in places; and a biography of Bakhuizen van den Brink (1870; 2d ed., 1890). A new edition of his works in 18 volumes was issued in 1901 (Haarlem). Consult: Groenewegen, *E. J. Potgieter* (Haarlem, 1893); Beets, *Persoonlijkeherinneringen* (ib., 1892); Verweg, *Het leven van Potgieter* (ib., 1903).

POTHIER, pō′tyȧ′, ROBERT JOSEPH (1699–1772). A French law writer. He was born at Orléans, was educated in a denominational school, studied law at the University of Orléans, and after his admission to practice was made a judge of a local court. In 1749 he was made a professor of law in the University of Orléans. Perhaps his most important work was *Pandectæ Justinianeæ in Novum Ordinem Digestæ* (1818–20). In English translation appeared *Maritime Contracts* (1821); *Treatise on Obligations* (3d ed., 1853); *Contract of Sale* (1839). Much of the Civil Code of France was compiled from his works.

POT-HOLES, or GIANT'S KETTLES. The erosional effect of falling water is often manifested in the production of circular depressions in the rock surface at the foot of falls and rapids wherever the current gives a gyratory motion to the sediment and stones which it sweeps along. These depressions vary in size from cuplike holes to great caldrons 40 or 50 feet in diameter and as many in depth. They are frequently filled with the well-rounded pebbles which acted as the abrasive agents in their excavation. In some stream valleys they occur not only along the present river channels but also high up on the sides, marking the various stages in the lowering of the valleys.

POTI, pō′tyė. A seaport on the west coast of the Caucasus, Russia, situated in a marshy and unhealthful region at the mouth of the Rion and 60 miles west of Kutais (Map: Russia, F 6). Although it has only a small harbor, Poti is one of the chief seaports of the Caucasus and the terminus of one of the principal railway lines. Its chief exports are corn, manganese, palm wood, and grain. The imports are insignificant. Pop., 1911, 17,543.

PO′TIDÆ′A (Lat., from Gk. Ποτίδαια, *Potidaia*). An important town of Macedonian Chalcidice (Map: Greece, Ancient, C 1). Originally a colony of Corinth, it became tributary to Athens. Its revolt from the latter city in 432 B.C. was one of the causes of outbreak of the Peloponnesian War. In 429 B.C. the town was forced to surrender to the Athenians. A century later it was rebuilt by Cassander and renamed Cassandria.

POTIER, pō′tyȧ′, ALFRED (1840–1905). A French physicist and engineer, born at Paris. He studied at the Polytechnique and the Ecole des Mines, was appointed engineer in 1863, engineer in chief in 1881, in the latter year became professor of physics in the Polytechnique, in 1891 was elected a member of the Academy of Sciences, and in 1893 professor at the Ecole des Mines. His researches include interesting studies in geology and investigations, with Joubert, Allard, and others, to determine a means of measuring the energy dispensed by magneto and dynamo-electric machines and instruments. His published writings consist of papers contributed to the *Comptes Rendus* of the Academy of Sciences, the *Journal de Physique*, the *Annales de Physique et de Chimie*, and other periodicals.

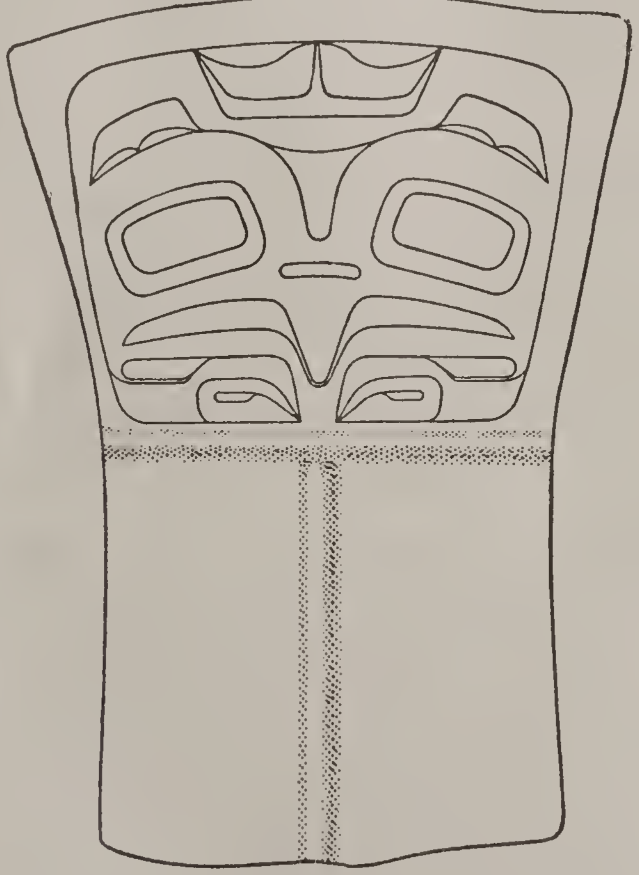
POT′IPHAR PAPERS, THE. A series of satires by George William Curtis, contributed to *Putnam's Magazine* (1853).

POTITII, pō-tĭsh′ĭ-ī. See PINARIA GENS.

POT′LATCH. A ceremonial distribution of gifts on a large scale. The word belongs to the Chinook jargon, into which it was adopted from the Nootka word *patshatl*, giving, or a gift. The potlatch occurs among the Indian tribes of the Pacific coast from Oregon to Alaska. The custom has been known to ethnologists for a long time, but was thoroughly misunderstood, having been represented as a sort of idealistic attempt on the part of the rich men of the tribe to distribute their surplus wealth among the less fortunate tribesmen. The real principle at the root of the potlatch is an investment of capital at an exceedingly high rate of interest. The unit of value at such transactions was a woven blanket, worth about 50 cents, which in recent times has been replaced by a woolen blanket secured from white traders.

Although potlatching brings with it considerable accumulation of wealth in the hands of single individuals, it is not wealth, economically considered, which counts with these people, but the social prestige achieved by giving sumptuous feasts at which large quantities of valuable materials are consumed, distributed, and even destroyed. A gift offered on such an occasion may not be refused, but must be returned within an appointed time, often with 100 per cent interest. Feasts are given to lower the social standing of a rival ("rivals fight with property alone," says the Kwakiutl), or to enhance one's social prestige, or a feast may be given for the benefit of another man who, if that is the case, must stand next to the giver of the feast.

As the values which thus change hands are often considerable, certain objects known as coppers (see figure) are used, which, while of small intrinsic value, often represent a large number of blankets, and may thus be compared to our bank notes of high denomination. The larger the number of blankets given away with a copper, the greater becomes the value of the copper. Thus, a copper may be worth as many as 7500 blankets, and will be called "all other coppers are ashamed to look at it"; another, worth 5000 blankets, will be called "making the house empty of blankets."


A POTLATCH COPPER.

The rivalry between chiefs expresses itself in the destruction of property on a tremendous scale. A chief will burn blankets, or destroy a canoe, or break a copper, and will thus show his superiority over the rival. Unless the latter can do the same or better, his name will be "broken."

Sometimes a chief will break a copper and give the broken parts to his rival. The latter, if he wants to keep his prestige, must break a copper of equal value and give the pieces to the first chief together with the fragments of the original copper. The first chief may then pay for all the fragments received. But the second chief, on receipt of the original copper, may also break a copper of equal value, but instead of giving them to the first chief, he may throw the fragments of both coppers into the sea. According to the Indians the second chief would thus show himself superior to his rival, who may have counted on receiving the fragments of both coppers in return, thus avoiding actual loss.

Consult Franz Boas, "The Social Organization and the Secret Societies of the Kwakiutl Indians," in *United States National Museum, Report, 1895* (Washington, 1896), and C. M. Barbeau, "Du Potlatch en Colombie Britannique," in *Société de Géographie de Quebec, Bulletin*, vols. v, vi (Quebec, 1911–12).

POTOCKA, pō̆-tôts′kȧ, ANNA (*née* Tyczkiewicz), COUNTESS (1776–1867). A Polish writer. She was the niece of Marshal Joseph Antony Poniatowski (see PONIATOWSKI), and was married first to Count Alexander Potocki and later to Count Wonsowicz. Her *Mémoires* of the years 1794 to 1820, giving an account of Napoleon's residence at Warsaw in 1806–07, were published at Paris in 1897 (8th ed., 1902). Her later years were spent for the most part in Paris, where she died. An edition of her *Un voyage d'Italie 1826–1827* appeared in 1898.

POTOCKA, SOPHIE DE WITT, COUNTESS (1766–1822). A famous beauty, known chiefly from Anton Graff's pastel portrait of her, made at Berlin, where she lived for some time and where she died. The portrait is familiar in print form. The Countess Potocka was of humble birth—the daughter of a Greek shoemaker at Constantinople—but she became the wife of a Russian general, and after her divorce from him she was married in 1795 to Count Stanislas Felix Potocki. See POTOCKI.

POTOCKI, pō̆-tôts′kē̆. The name of a Polish family of high rank, possessing large estates in Galicia and the Ukraine. After the sixteenth century several members of the family held important places in state and church. Among the most noteworthy may be mentioned: 1. COUNT STANISLAS FELIX POTOCKI (1745–1805), chief of the Polish artillery. In 1792 he joined Branicki and Rzewuski in issuing the manifesto of the confederation of Targovitza (q.v.). The next year he attempted, with the aid of Catharine II of Russia, to carry out the objects of the confederation. The insurrection of 1794 forced him to leave Poland, and he fled to Russia. In his absence he was sentenced to death for treason, but the success of Suvarov enabled him to return to Poland. He was appointed Russian field marshal by Catharine in 1795. He married Sophie de Witt (see POTOCKA, SOPHIE).

2. COUNT IGNAZY POTOCKI (1741–1809), grand marshal of Lithuania, a cousin of Stan-

islas Felix. He helped to form the constitution of 1791; fled to Prussia upon the invasion of Poland by the Russians, but returned after the success of Kosciuszko, and became a member of the new government. He was made prisoner by Suvarov and was confined in Schlüsselburg. Released in 1796, he lived in Galicia till the approach of Napoleon's army in 1806, when he was again imprisoned for a short time. In 1807 he again returned to Warsaw and worked in behalf of the newly founded Duchy. In 1809 he was at the head of a deputation which was sent by the Grand Duchy of Warsaw to Napoleon in Vienna. There Count Potocki died. The best known of his literary works is that entitled *Vom Entstehen und Untergange der polnischen Konstitutionen vom 3ten Mai 1791.*

3. Count Stanislas Kostka Potocki (1752–1821), brother of Ignazy, was prominent in drawing up the constitution of 1791, and after the second partition of Poland was for a short time under arrest. After his release he became a devoted patron of science and literature. In 1807 he became head of the educational system in the Duchy of Warsaw, and, after the Kingdom of Poland was reorganized (1815), became Minister of Public Instruction. He wrote a treatise on *The Art of the Ancients* and *On Eloquence and Style* (1815).

4. Count Jan Potocki (1761–1816) was eminent as a student of Slavic antiquities and wrote several historical works, among them *Fragments historiques et géographiques sur la Scythie, la Sarmatie et les Slaves* (4 vols., Brunswick, 1795); *Histoire primitive des peuples de Russie* (St. Petersburg, 1802). He also wrote memoirs upon Egyptian antiquities and *Voyage dans l'Empire de Maroc* (Warsaw, 1792). These works of Count Jan Potocki were printed in editions of but 100 copies, and are therefore very rare. They have some value as collections of material.

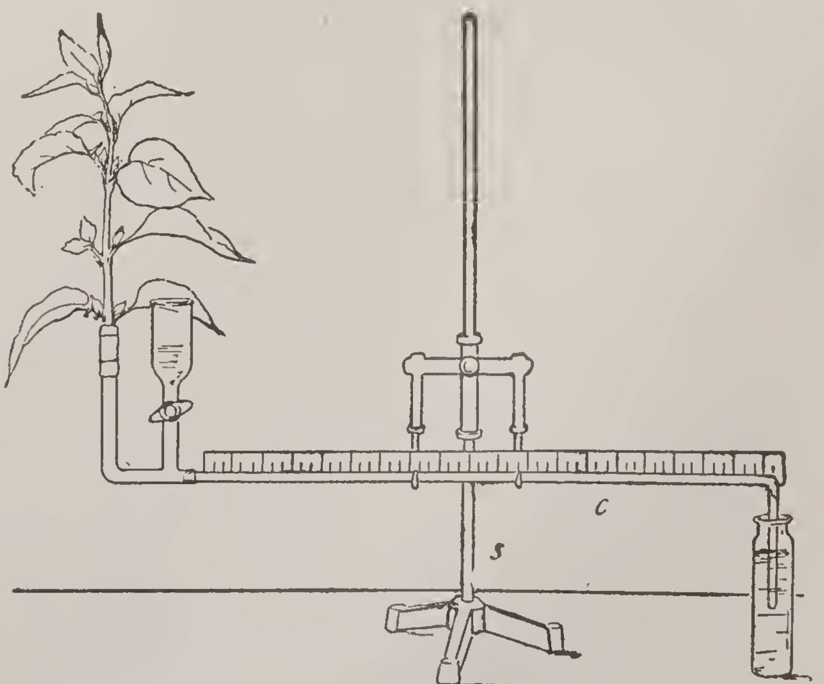
5. Count Alfred Potocki (1817–89) rose to prominence as a member of the Galician Diet and the Austrian House of Peers. From 1867 to 1870 he was Austrian Minister of Agriculture, and from April, 1870, to February, 1871, head of the cabinet.

POTOCKI, Waclaw (c.1622–97). The most prolific of Polish poets. He served in the army, fighting in the war against the Cossacks (1653); in 1683 was appointed commissioner to map the boundary of Silesia; and lived his last years on his hereditary estate of Luzna. Potocki is known in our time for an epic, *Wojna Chocimska,* on the victory over the Turks at Chocim in 1621, a poem which received no recognition from his contemporaries and was lost until 1850. It is an epic of much merit, with many satiric contrasts between the heroic simplicity of old times and the luxury of the new. Potocki's contemporary fame rested on *Poczet herbów* (1696), a heraldry in verse. Some devotional poems (1690); *Jovialitates* (1747), consisting of witty epigrams; *Syloret* (1764), a tale; and a version of Barclay's *Argenis* (1697) also came from his pen.

POTO'MAC RIVER. One of the most important rivers of the eastern United States, forming throughout its course the boundary between Maryland on the north and east and West Virginia and Virginia on the south and west (Map: Maryland, E 3). Its chief headwaters are the North Branch, about 110 miles long, which rises in the northeast part of West Virginia, and the South Branch, which rises in Highland Co., Va., and Pendleton Co., W. Va., and flows northeast about 140 miles to its confluence with the North Branch about 15 miles below Cumberland, Md. Thence the main stream flows in a winding southeast course till it empties into Chesapeake Bay, 75 miles from the Atlantic Ocean. Its total length is about 450 miles, and its chief tributaries, besides the South Branch, are the Shenandoah from the south and the Monocacy from the north. The scenery along its upper course is picturesque, especially where it breaks through the Blue Ridge at Harper's Ferry. There are several falls in its passage through the mountains and through the piedmont plain below, the Great Falls (which include about a mile of rapids and a cataract about 35 feet high) being about 15 miles above Washington. At that city, 125 miles from its mouth, the river becomes a tidal stream, navigable for large ships, and for the last 100 miles it is a magnificent estuary from 2 to 7 miles wide. The Chesapeake and Ohio Canal follows its course from Georgetown to Cumberland. The whole region through which the river flows is full of historic landmarks. Opposite Washington is Arlington (q.v.), and a short distance below are Alexandria and Mount Vernon. The river drains an area of about 14,500 square miles. Consult H. N. Parker and others, *Potomac River Basin* (Washington, 1907), and J. P. Farley, *Three Rivers* (ib., 1910).

POTOMAC FORMATION. A name applied to a series of deposits which are chiefly of Lower Cretaceous age, but may be also partly Jurassic. The formation is found along the Atlantic border of the United States from Marthas Vineyard to Georgia, and also up the Mississippi valley to Tennessee. It consists of a series of sands, gravels, and clays. The latter are worked at many points, notably in New Jersey, and certain members of the series supply iron ore and glass sand. Consult White, "Correlation Papers, Cretaceous," in *United States Geological Survey, Bulletin No. 82* (Washington, 1893). See Cretaceous System.

POTOM'ETER (from Gk. ποτόν, *poton,* drink + μέτρον, *metron,* measure). An instrument for observing the rate at which plants evaporate water. The simple form used in physiological laboratories consists essentially of a graduated capillary glass tube (*c* in the figure), to which



POTOMETER.

is connected a transpiring shoot. The tube is filled with water and the lower end dipped into water. As evaporation from the leaf surface proceeds water is drawn up the tube, the narrow bore of which accelerates the rate of flow. This may be made evident by lifting the end of the tube for an instant and allowing air to enter. On replacing the tube water again enters, and as the short bubble travels along the tube its rate may be observed and recorded. By exposing the leaves to varying conditions of light, heat, wind, and moisture in the air, the effect of external conditions upon transpiration may be easily shown. Somewhat complex self-registering instruments have been made. See TRANSPIRATION.

POTOO, pō-to͞o′, or GRAND POTOO. A name given by the Creoles in the West Indies to one of the large nightjars (*Nyctibius jamaicensis*), especially common in Jamaica. It represents a small group confined to South America and the Antilles, remarkable for the tooth of the upper mandible.

POTOSÍ, pō′tō-sē′. A department of southwest Bolivia (Map: Bolivia, D 8). Area (est.), 48,799 square miles. The surface is very mountainous, and at the northwestern end is situated an extensive saline marsh known as the Grandes Salinas. The region is drained chiefly by the headstreams of the Pilcomayo. On account of the rigorous climate, which is subject to sudden changes, agriculture is of slight importance, although some barley, maize, and potatoes are grown in the more protected localities. The chief industry is the exploitation of the silver mines, which are supposed to be the richest in Bolivia. Besides silver there are also found gold, tin, and copper. Pop., 1900, 325,615, the bulk of whom were Indians. Estimates since 1912 vary from 320,000 to 365,000. Capital, Potosí (q.v.).

POTOSÍ. The capital of the Department of Potosí, Bolivia. It is situated on the Cerro de Potosí at an altitude of 13,325 feet, being probably the highest town in the world (Map: Bolivia, D 7). It lies several hundred feet above what has been considered the highest inhabitable altitude, and, owing to the rarity of the atmosphere, infant mortality is so great that the population can be kept up only by immigration. A large part of the city lies in ruins, through which passes the now deserted Prado, lined with statues and other evidences of former grandeur. There are several fine and solid buildings, such as the great granite cathedral and the mint, the latter built in 1562 at a cost of over $1,000,000, but no longer used. Potosí has a library, a museum of mineralogy, a theatre, and a school of typography for girls, established in 1912. The city owes its origin to the silver lodes which were discovered in the Cerro in 1546 and which for a long time remained the richest silver mines in the world. The total output up to 1850 is estimated at over $5,000,000 per year. The city itself grew rapidly, and in the seventeenth and eighteenth centuries was the largest city in the New World, its population being then estimated as high as 170,000. The mines are now almost abandoned, only a few of the 2000 shafts being worked. Pop. (est.), 25,000. Consult Contzen, *Potosí* (Hamburg, 1893).

POTOTAN, pō-tō′tän. A town of Panay, Philippines, in the Province of Iloilo, situated on the Jalaur River, 16 miles north of Iloilo (Map: Philippine Islands, D 5). It is well laid out and has a large church. Pop., 1903, 37,373, including the suburbs of Dingle and Mina.

POT-POURRI, pō′po͞o′rē′ (Fr., rotten pot). In music, a selection of favorite pieces strung together without much connection, so as to form a sort of medley. Such arrangements usually have very little artistic value.

POTSDAM, pŏts′dȧm. The capital of a government district of the same name, a royal residence and the seat of the administration of the Prussian Province of Brandenburg, situated on the right bank of the Havel River opposite the influx of the Nuthe, 16 miles southwest of Berlin, with which it is connected by three railway lines (Map: Germany, E 2). The town is celebrated for its beautiful situation amid the numerous lakes of the Havel, as well as for its picturesque environs embellished by luxurious gardens, royal palaces, fountains, statues, etc. The city proper consists of the old town and four suburbs. Of the suburbs the Teltower, on the south, is connected with the old town by a fine stone bridge crossing the intervening Freundschaftsinsel. Potsdam is laid out in regular, broad and shaded streets, which form a number of fine squares. The Wilhelmsplatz has a statue of Frederick William III, and the Lustgarten, opposite the palace, is adorned with a number of statues and busts, including a statue of Frederick William I. The principal churches are the Garrison Church, built in 1731–35, with a high tower, and containing the remains of Frederick the Great and his father in a vault under the chancel; the church of St. Nicholas (1830–37), built from designs by Schinkel, with a fine dome; and the Friedenskirche (1845–50), in the style of an early Christian basilica, at the entrance to the park of Sans Souci (q.v.).

Of the many secular edifices of note may be mentioned the royal palace, a large quadrangular building with a colonnade, originally erected in 1670 and rebuilt in 1750, and containing the apartments of Frederick the Great; the town hall (1754), with a gilded figure of Atlas on its gable; the military orphan asylum; the theatre; the large barracks, etc. Potsdam has a number of fine gates, of which the Brandenburg Gate, in the west, built in 1770 in the style of a Roman triumphal arch, leads from the city to the park of Sans Souci. The park contains, besides the famous residence of Frederick the Great, the palace of Charlottenhof, with reliefs by Thorvaldsen, and the new palace (1763–69), at the west end of the park, founded by Frederick the Great and used as a summer residence by Emperor William II.

Potsdam is not an industrial city, but has a few manufactures, including sugar, beer, and optical instruments. The Geodetic Institute is located here. Of the noted places in the vicinity may be mentioned the Russian settlement of Alexandrovka, north of the city, founded by Frederick William III in 1826; the Neu-Garten, stretching along the Heilige See, with the Marble Palace on the lake; the Pfingstberg, in the north, with a fine Belvedere; the Klein-Glienicke, on the left bank of the Havel, with the palace of Prince Frederick Leopold, surrounded by a splendid park; the palace of Babelsberg, with its fine art collections and beautiful fountains; the Brauhausberg, commanding a fine view of the surrounding country; and the Telegraphenberg, with an astrophysical observatory. Pop., 1900, 59,814; 1910, 62,243, chiefly Protestants.

The importance of Potsdam dates from the second half of the seventeenth century, when the Great Elector Frederick William built there a palace and laid out the Lustgarten. It was, however, during the reign of Frederick the Great that Potsdam attained its full development and fame. Consult: *Geschichte der königlichen Residenzstadt Potsdam*, edited by A. R. (Potsdam, 1883); Sello, *Potsdam und Sans Souci* (Breslau, 1888); Kurt Kuhlow, *Das königliche Schloss Charlottenhof bei Potsdam* (Berlin, 1911).

POTSDAM, pŏts′dăm. A village in St. Lawrence Co., N. Y., 25 miles east of Ogdensburg, on the Raquette River and on the New York Central Railroad (Map: New York, E 1). It is the seat of a State normal school and of the Thomas S. Clarkson Memorial College of Technology, founded in 1895. Potsdam sandstone (q.v.) is quarried extensively in the vicinity. Other industries are agriculture and lumbering. The principal manufactures include paper, flour, lumber products, farm implements, and machinery, the industrial interests of the village being favored by the excellent water power of the Raquette River. Potsdam was settled in 1803 and incorporated as a town in 1806. The village of Potsdam was incorporated in 1831. Pop., 1900, 3843; 1910, 4036.

POTSDAM SANDSTONE. A formation of Upper Cambrian age, so called from the type locality at Potsdam, N. Y. The rock is a red or yellow sandstone, sometimes altered to quartzite, and of great hardness. It is employed extensively as a building stone. The formation is developed on the borders of the Adirondack Mountains and in Virginia, Michigan, and Wisconsin. See CAMBRIAN SYSTEM.

POT′STONE (translation of its Latin name, *lapis ollaris*). An impure variety of talc containing chlorite. It is usually greenish gray to dark green in color, and occurs massive or in granular concretions. Being easily cut when newly mined, it was made into pots and other household utensils by the ancients.

POTT, August Friedrich (1802–87). A German philologist, the founder of modern scientific etymology. He was born at Nettelrede, Hanover, Nov. 14, 1802, and was educated in the lyceum at Hanover, studied theology, philology, and natural sciences at Göttingen (1821–25), then was assistant at the Gymnasium in Celle until 1827, when he went to Berlin to become a pupil of Bopp. In 1830 he became privatdocent there, and in 1833 was appointed professor of comparative philology at the University of Halle, which position he occupied until his death, July 5, 1887. The work that established his reputation was the *Etymologische Forschungen auf dem Gebiet der indogermanischen Sprachen* (2 vols., 1830–36), published afterward in a revised and much enlarged edition under the title *Wurzelwörterbuch der indogermanischen Sprachen* (6 vols., 1859–76). Pott was author of numerous other works in the same field, of many essays and critical reviews, and of important treatises in Ersch and Gruber's *Allgemeine Encyclopädie*. He also edited Wilhelm von Humboldt's *Ueber die Verschiedenheit des menschlichen Sprachbaues*, with an introductory essay (2 vols., 1876; 2d ed., 1880). Consult Von der Gabelentz, in *Allgemeine deutsche Biographie*, vol. xxvi (Leipzig, 1888), and Horn, in Bezzenberger's *Beiträge zur Kunde der indogermanischen Sprachen*, vol. xiii (Göttingen, 1888).

POTT, Percival (1713–88). An English surgeon. He was born in London, where he served as assistant surgeon in St. Bartholomew's Hospital (1745–49) and as surgeon (1749–87). He was distinguished for his investigation of angular curvature of the spine, the consequence of disease of the bones of the spinal column, on which account the affection is known as Pott's disease (q.v.). His principal works are: *A Treatise on Ruptures* (1756; 4th ed., 1775); *Observations on the Nature and Consequences of Wounds and Contusions of the Head, etc.* (1760); *Remarks on the Disease Commonly Called Fistula in Ano* (1765; 4th ed., 1775); *Some Few General Remarks on Fractures and Dislocations* (1769; 2d ed., 1773; Fr. ed., Paris, 1788; It. ed., Venice, 1784); *Remarks on That Kind of Palsy of the Lower Limbs Which is Frequently Found to Accompany a Curvature of the Spine* (1779; Dutch and French translations).

POT′TER, Alonzo (1800–65). An American Protestant Episcopal bishop, brother of Horatio Potter and father of C. N., E. N., H. C., and R. B. Potter (qq.v.). He was born at Beekman (now La Grange), Dutchess Co., N. Y., of Quaker parentage, July 6, 1800. In 1818 he graduated at Union College, where afterward he served as tutor, and in 1821 was appointed professor of mathematics and natural philosophy. Meanwhile he studied theology, and was ordained in 1824. The same year he married a daughter of President Eliphalet Nott of Union College. From 1826 to 1831 he was rector of St. Paul's Church, Boston. In 1832 he returned to Union as professor of philosophy and political economy; in 1838 he was made vice president of the college, and was virtually president until 1845, when he was chosen Bishop of Pennsylvania. As bishop he showed great administrative ability; many new churches were built in his diocese, and an Episcopal hospital, academy, and theological school were founded and endowed in Philadelphia. He was a friend of the negro and active in work for young men. For his health Bishop Potter went to California, by sea, and he died at San Francisco, July 14, 1865. He published several textbooks, also a volume of *Discourses, Charges, Addresses, and Pastoral Letters* (1858) and *Religious Philosophy* (1870), and edited *Lectures on the Evidences of Christianity* (1855).

POTTER, Clarkson Nott (1825–82). An American lawyer and legislator, son of Bishop Alonzo Potter. He was born at Schenectady, N. Y., graduated at Union College in 1842, then spent a year at the Rensselaer Polytechnic Institute, Troy, and in 1854 became a surveyor in Wisconsin. Later he studied law, and in 1848 settled in New York, where he became one of the most eminent members of the bar. In 1869–75 and 1877–81 he was a Democratic member of Congress. Potter served as president of the American Bar Association in 1881.

POTTER, Edward Clark (1857–). An American sculptor. He was born at New London, Conn., and studied under Mercié and Fremiet in Paris. With D. C. French he modeled the Columbus quadriga and groups of draft horses and cattle for the Chicago Exposition, the horses for equestrian statues of General Grant (Fairmount Park, Philadelphia), Washington (Paris and Chicago), and General Hooker (Boston), and the quadriga for the Minneapolis State House (1906). Although Potter's chief importance is as a sculptor of animals, and preeminently of horses, his versatility is proved by a charming "Sleeping Faun" (Art Institute, Chicago) and by the dignified statues of Robert Fulton (Congressional Library, Washington), Governor Blair (Lansing, Mich.), and General Slocum (equestrian, Gettysburg). Two of his animal groups are in the Morgan Library, New York. He was elected a National Academician in 1906 and received a gold medal at St. Louis in 1904.

POTTER, Eliphalet Nott (1836–1901). An American educator, son of Bishop Alonzo Potter. He was born at Schenectady, N. Y., and graduated at Union College in 1861 and at the Berkeley Divinity School a year later. From 1862 to 1869 he was rector of the church of the Nativity in South Bethlehem, Pa. In 1866 he was chosen professor of ethics in Lehigh University, in 1869 became associate rector of St. Paul's, Troy, N. Y., and in 1871 was chosen president of Union College. Two years later, when the college became a university, he was elected its chancellor. In 1884 he became president of Hobart College and in 1897 president of the Cosmopolitan (correspondence) University. He published, among other writings, a volume of sermons.

POTTER, Henry Codman (1835–1908). An American Protestant Episcopal bishop. He was born at Schenectady, N. Y., May 25, 1835, a son of Bishop Alonzo Potter (q.v.), and was educated at the Episcopal Academy in Philadelphia, at Union College, and at the Theological Seminary of Virginia, from which he graduated in 1857. Ordained deacon in the latter year and priest in 1858, he became rector successively of Christ Church, Greensburg, Pa. (1857), St. John's Church, Troy, N. Y. (1859), assistant at Trinity Church, Boston (1867), and rector of Grace Church, New York (1868). In 1883 he was chosen Bishop Coadjutor of New York, and on the death of his uncle, Bishop Horatio Potter (q.v.), in 1887, he became Bishop. From 1863 to 1883 he had been secretary of the House of Bishops. Honorary degrees came to him from various American universities and from Oxford and Cambridge. His death occurred July 21, 1908.

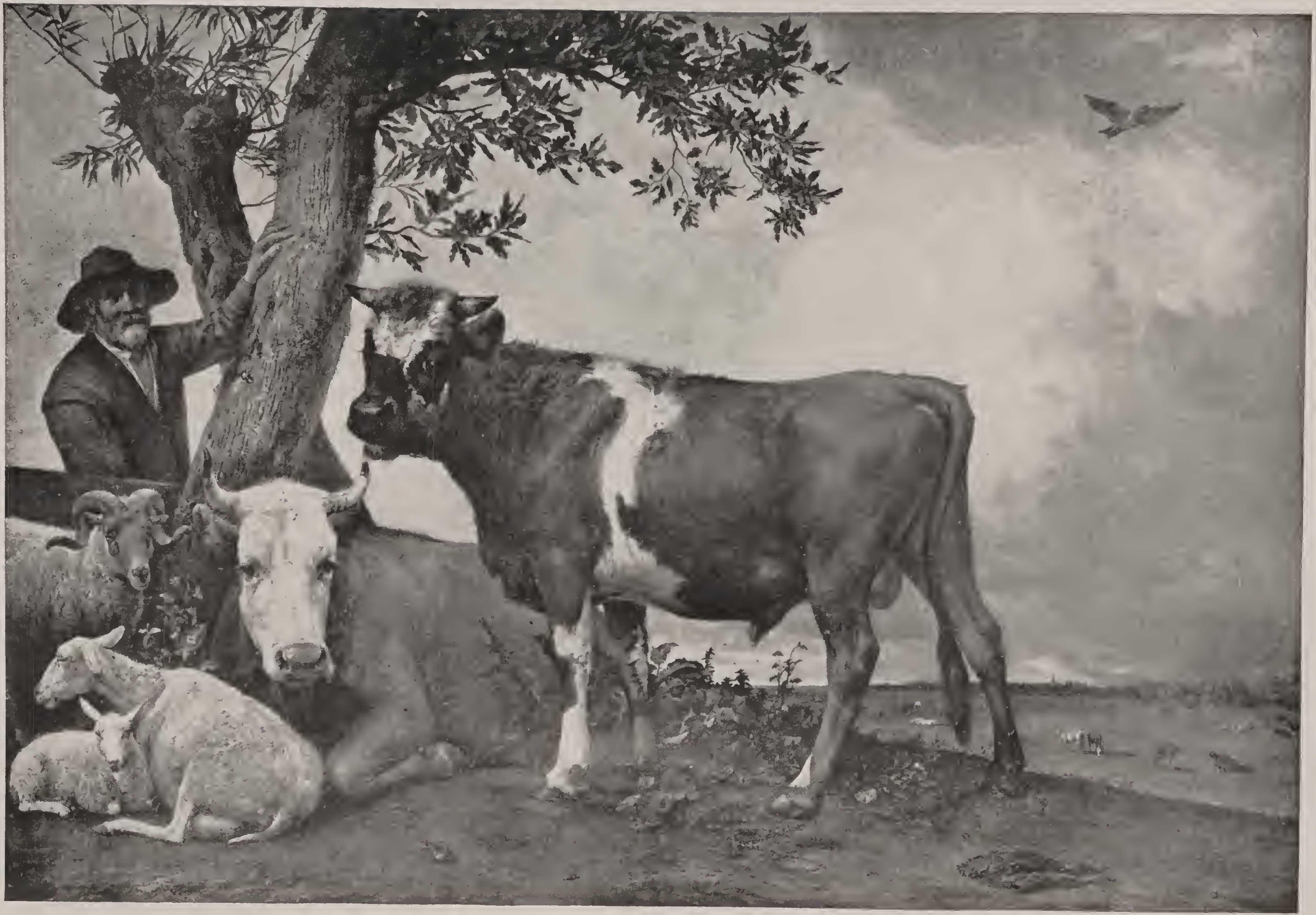
While at Grace Church Bishop Potter had introduced many institutional activities and had aided greatly in settlement work. Subsequently he did much to promote cordial relations between employer and employee by suggesting settlements of labor disputes. His exposure of police protection of vice resulted in the formation of the Committee of Fifteen and helped to elect a reform mayor, Seth Low; and he was one of the founders of the National Civic Federation. It was through Bishop Potter's initiative that the great cathedral of St. John the Divine (q.v.) on Morningside Heights, New York, was planned and begun. In this cathedral the Spanish chapel of St. James was built by Mrs. Potter as a memorial to her husband—Bishop Potter had married as his second wife a woman of large wealth, the widow of Alfred Corning Clark. Severe criticism from all over the country met Bishop Potter's effort in 1904 to provide a respectable place where poor men could gather and where intoxicating liquors were to be sold. This was the so-called Subway Tavern at Mulberry and Bleecker streets. Its founder, however, stoutly defended it on the ground that "the saloon is the poor man's club." Besides numerous sermons and addresses Bishop Potter published: *Sisterhoods and Deaconesses at Home and Abroad* (1871); *The Gates of the East: A Winter in Egypt and Syria* (1876); *The East of To-Day and To-Morrow* (1902); *The Citizen in Relation to the Industrial Situation* (1902); *Law and Loyalty* (1903); *Reminiscences of Bishops and Archbishops* (1906). Consult H. A. Keyser, *Bishop Potter, the People's Friend* (New York, 1910), and George Hodges, *Henry Codman Potter, Seventh Bishop of New York* (ib., 1915), the official biography.

POTTER, Horatio (1802–87). An American Protestant Episcopal bishop. He was born at Beekman (now La Grange), Dutchess Co., N. Y., and was a brother of Bishop Alonzo Potter (q.v.). He graduated at Union College in 1826 and was ordained priest in 1828. The same year he was chosen professor of mathematics and natural philosophy in Washington (now Trinity) College, Hartford, Conn. He was rector of St. Peter's Church, Albany, N. Y., from 1833 to 1854, was next Provisional Bishop of the diocese of New York, and in 1861 became Bishop. The diocese prospered greatly under his able administration. He was especially interested in city mission work, and was very successful in promoting good feeling within the Church.

POTTER, Louis (1873–1912). An American sculptor. He was born at Troy, N. Y., and was a pupil of Charles and Montague Flagg. In 1896 he went to Paris, where he studied painting under Merson and modeling under Jean Dampt. His earliest works were a series of statuettes, including "The Snake Charmer," "A Tunisian Jewess," and "A Young Bedouin," the result of a trip to Tunis in 1899. On his return to the United States he first made a specialty of Alaskan and American Indian subjects, such as "The Taku Wind," "The Spirit of the Night," and "The Clam Diggers," strongly realistic in conception and treatment. His later works, however, are imaginative and symbolical. They include the heroic group "Earth Bound," "The Earth's Unfoldment," and the "Earth Man" (1912). Potter modeled busts of Boutet de Monvel and Mark Twain, and designed the Horace Wells Memorial at Hartford, Conn.

POTTER, Paul (Paulus) (1625–54). One of the principal animal painters and etchers of the old Dutch school. He was born at Enkhuizen in November, 1625. In 1631 his father, Pieter Simonz Potter, a mediocre painter, became a citizen of Amsterdam, and from him Paulus received his first lessons. He then studied with Nicolas Moeyaert, whose influence is evident in his earliest work; but he worked chiefly after nature, as is evident from his very independent studies, of which four volumes are preserved in the Berlin Museum—the only surviving example of such studies by a Dutch painter of the first rank. In 1646 he became a member of the Painters' Guild of Delft, and in 1649 he settled at The Hague, where he married the daughter of an influential architect. He was already a famous painter, rejoicing in the patronage of Maurice of Nassau, of Princess Amalie, wife of the stadholder, and others of the nobility. In 1653, at the solicitation of Burgomaster Tulp, he removed to Amsterdam, where he died of consumption in January, 1654.

Notwithstanding his short life (28 years) he



PAUL POTTER

"THE BULL," FROM THE PAINTING IN THE GALLERY AT THE HAGUE

produced a large number of pictures—177 according to De Groot. He rendered the character of animals with great power and truth; his drawing was usually correct, imparting an almost plastic effect, and his color was delicate. Although he painted with great care and often with overemphasized detail, he did not lose the ensemble. His backgrounds—the flat Dutch landscape, sometimes with a few trees—are true in color and perspective. His best-known picture is the life-size "Bull" (Hague Museum), of which the chief figure is a fine piece of realistic animal characterization; but neither this nor his "Bear Hunt" (Amsterdam, Rijks-Museum) equals his smaller pieces. The Hermitage at St. Petersburg possesses 11, including the famous "Cow," refused by the stadholder's wife, and the "Judgment of the Animals over the Hunter"; others are in the museums of The Hague, Amsterdam, Paris, Berlin, Dresden, and especially in English private collections. Potter was also an etcher of note, simple and direct in his treatment. He left no school, but exercised considerable influence on contemporaries, whose work has been confounded with his —such men as Du Jardin, Albert Klomp, Camphuysen, and Murant. Consult Emile Michel (Paris, 1907); also Hofstede de Groot, *Catalogue of Dutch Painters* (London, 1908), and Grattel Duplessis, *Eauxfortes de Paul Potter* (Paris, 1876).

POTTER, Paul Meredith (1853–). An American dramatist, born at Brighton, England. He served as foreign editor (1876–83), London correspondent (1883–84), and dramatic critic (1885–87) of the New York *Herald*, and in 1888 joined the staff of the Chicago *Tribune*. One of his most successful plays was the dramatization of Du Maurier's novel, *Trilby* (1895; revived with some members of the original cast and with Phyllis Terry in the title rôle, 1915). Others of his plays include: *The Ugly Duckling* (1890); *Our Country Cousins* (1893); *The Pacific Mail* (1894); *The Conquerors* (1898); *Notre Dame* (1903); *Nancy Stair* (1905); *The Honor of the Family* (1907); *Arsène Lupin* (1909); *Parasites* (1910); *The Zebra* (1911); *Faithless Eckhart* (1915).

POTTER, Robert Brown (1829–87). An American soldier, born in Boston, a son of Bishop Alonzo Potter. He studied at Union College and was admitted to the bar, but in 1861 withdrew from practice in order to enter the Federal army. He was commissioned major of the Fifty-first New York Volunteers, led three companies in the assault at Roanoke Island, was wounded at Newbern, fought in the second Bull Run campaign and at South Mountain, and distinguished himself by making a spirited charge at the head of his regiment at Antietam, where he was again wounded. He was made a brigadier general of volunteers in 1863, commanded a division in the Knoxville campaign, served with Grant in the Wilderness, and was a third time wounded in the last assault made on Petersburg after the explosion of the mine. He was commissioned major general of volunteers in 1865 and resigned in 1866. In 1866–69 he was receiver of the Atlantic and Great Western Railway. He afterward lived for some time in England, but returned to Newport, R. I., where he died.

POTTER-BEE. A mason bee of the genus *Osmia* and its allies, which constructs small globular cells of earth and attaches them to the stem of a plant in much the same manner as do the potter wasps (q.v.) of the family Eumenidæ.

POTTER'S CLAY. A term commonly applied to any fine-grained, plastic clay that can be used in the manufacture of pottery. Clays employed for the making of pottery must have sufficient plasticity, and must also burn to the proper body without warping or cracking in the firing process. In order to produce these results it is sometimes necessary to mix two or more kinds of clay together. Potter's clays are found in many localities and also in many different geological formations; those found in the recent surface deposits are commonly too impure to permit their use for anything except the cheaper grades of ware. The higher grades of pottery are always molded from a mixture of at least three kinds of clay, and in this case the raw material is sometimes freed from gritty particles by a preliminary washing. After mixing it is sometimes stored in damp cellars for a year or more, with the idea that its plasticity will thereby be improved. The value of potter's clay ranges from a few cents a ton for common earthenware clays up to $10 or $12 a ton for china clays. In the United States the lower and medium grades of potter's clays are abundant, but the demand for the higher grades is greater than the supply, and therefore large quantities are annually imported from England. Considerable ball clay is now obtained in the United States. The following are analyses of some well-known American potter's clays:

ANALYSES OF POTTER'S CLAYS

COMPONENTS	1	2	3	4
Silica	45.70	70.26	56.44	45.39
Alumina	40.61	19.23	26.60	39.19
Ferric oxide	1.39	......	2.00	.45
Lime	.45	......	.47	.51
Magnesia	.09	......	.63	.29
Alkalies	2.82	......	3.46	.83
Water	8.98	10.03	7.59	14.01
Moisture	.35	.83	2.48	......
Total	100.39	100.35	99.67	100.67

1, washed kaolin, Webster, N. C.; used in porcelain manufacture. 2, stoneware clay, Greentown, Ohio. 3, yellow-ware clay, East Palestine, Ohio. 4, Florida ball clay, used in whiteware manufacture.

The following varieties of potter's clay are commonly recognized:

Kaolin, or China Clay.—A white-burning residual clay used in the manufacture of china.

Ball Clay.—A plastic, white-burning clay used as an ingredient of white earthenware and porcelain bodies and added on account of its plasticity and bonding power.

Earthenware Clay.—Any plastic clay suitable for common earthenware.

Stoneware Clay.—A plastic potter's clay which burns to a dense impervious body. The clays employed for this purpose are commonly semirefractory.

Yellow-Ware Clay.—A semirefractory clay employed for making yellow ware. It is not burned to a vitrified body.

Retort Clay.—A dense-burning fire clay much used in some districts for the manufacture of stoneware.

The value of potter's clay produced in the United States in 1913 was as follows: kaolin,

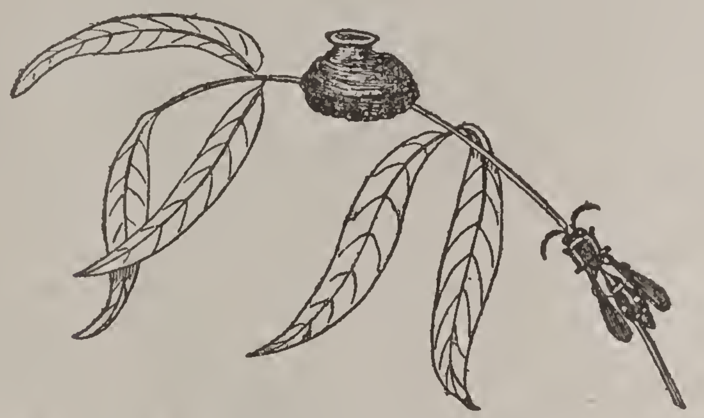
$235,457; ball clay, $237,672; stoneware clay, $143,597. The imports of kaolin in the same year were valued at $1,623,993.

Consult: Langenbeck, *The Chemistry of Pottery* (Easton, 1895); Heinrich Ries, "The Clays of the United States East of the Mississippi," in *United States Geological Survey, Professional Paper No. 11* (Washington, 1903); id., *Clays: Their Occurrence, Properties, and Uses* (2d ed., New York, 1910); C. F. Binns, *The Potter's Craft* (ib., 1910). See Clay; Kaolin; Pipe Clay; Pottery.

POTTER'S FIELD. A place for the burial of such as have neither friends nor means to provide burial for them. The name comes from Matt. xxvii. 7. See Aceldama.

POTTER'S ORE. See Galena.

POTTER-WASP. Any wasp of the family Eumenidæ, the species of which form globular cells of clay or sand which are attached by a small pedestal to some twig. The shape is frequently very beautiful, and is precisely that of certain greatly admired Indian vessels and baskets. These cells are filled with caterpillars, sawfly larvæ, and the larvæ of beetles, by the mother wasp, an egg being laid in each cell and the resulting grub feeding upon the stored insects.



A POTTER-WASP AND ITS NEST

POT'TERY (from *pot*, AS. *pott*, pot, from Ir. *pota*, *puite*, Welsh *pot*, Bret. *pōd*, pot; connected with OIr. *ól*, drink, OPruss. *poūt*, Lat. *potare*, Æolic Gk. *πώνειν*, *pōnein*, Skt. *pā*, to drink). Pottery, in the general use of the term, is any kind of ware which is made of clay or claylike substances and fixed by firing, including the three great divisions of earthenware, stoneware, and porcelain. (See Brick; Faïence; Majolica; Porcelain; Stoneware; Terra Cotta.) More specifically the term "pottery" is confined to those ceramic wares which possess opacity and are lacking in vitrification. Stoneware, which is a connecting link between pottery and porcelain, is also opaque, but is more or less vitrified, while porcelain is vitreous, translucent, and resonant when struck, being composed of finer ingredients and fixed at a higher temperature. Pottery, or earthenware, as distinguished from stoneware and porcelain, may be divided into five classes, according to the character of its glaze or enamel or its entire lack of the same, viz. (1) unglazed, (2) varnished or lustrous, (3) glass-glazed, (4) tin-enameled, (5) lead-glazed.

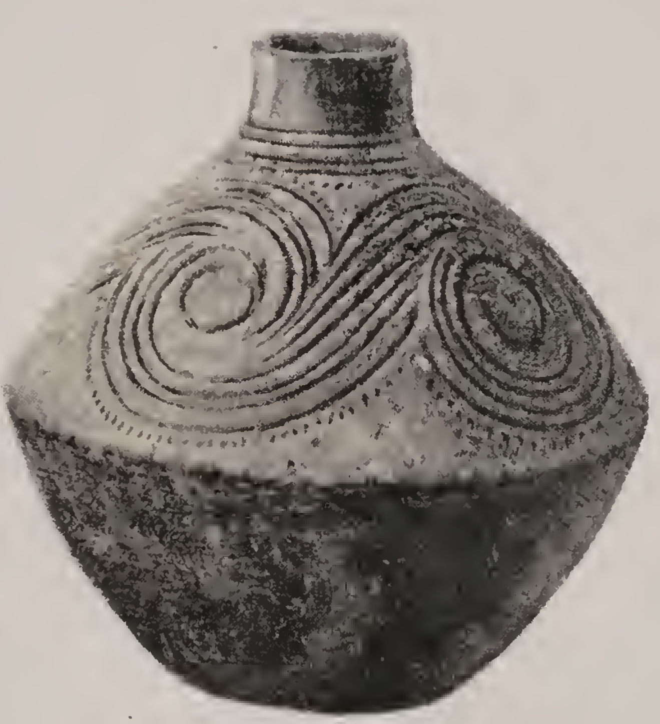
Manufacture. The doughlike condition into which clay can be worked with water and the hardness it may be made to acquire by burning are qualities which have been turned to account by man from the earliest times, and it is upon these that the potter's art essentially depends. If a piece of clay be examined it will be found that it consists of exceedingly minute particles, held together by aggregation when moist, but if dried it can be easily reduced to an impalpable powder by mere pressure; and if instead of drying we add an excess of water, it may be so mixed and held in suspension in the water that it appears almost to be dissolved. In time, however, it is deposited as a sediment, and when the excess of water is removed it is a soft tenacious paste, which is so nonelastic that it will retain the smallest impression made in it without change. This minute division of its particles and the absence of elasticity are its most valuable qualities. Clay also contains water in chemical combination, and this, once expelled by the process of baking, cannot be replaced. Hence it is that while sun-dried bricks, or adobe, perish in a moist climate, burnt bricks are imperishable. Burnt clay, however finely ground and thoroughly mixed with water, never regains its plasticity. Clays are not of the same purity and quality; the commonest is that of brick fields, which is one of the most abundant substances in nature; but it is so mixed up with iron and other foreign ingredients that, except for bricks, tiles, and the coarsest kinds of pottery, it is not used by advanced peoples.

The purest kind of potter's clay is called kaolin (q.v.). Pipe clay and potter's clay are more abundant than kaolin. They contain more iron or other impurities which give them their yellow or brown appearance when fired. The general process of preparing clay for the potter's use is described under Clay. In preparing the finer materials for porcelain many other operations are required, all having the same object—the purification and extremely minute division of the substances used.

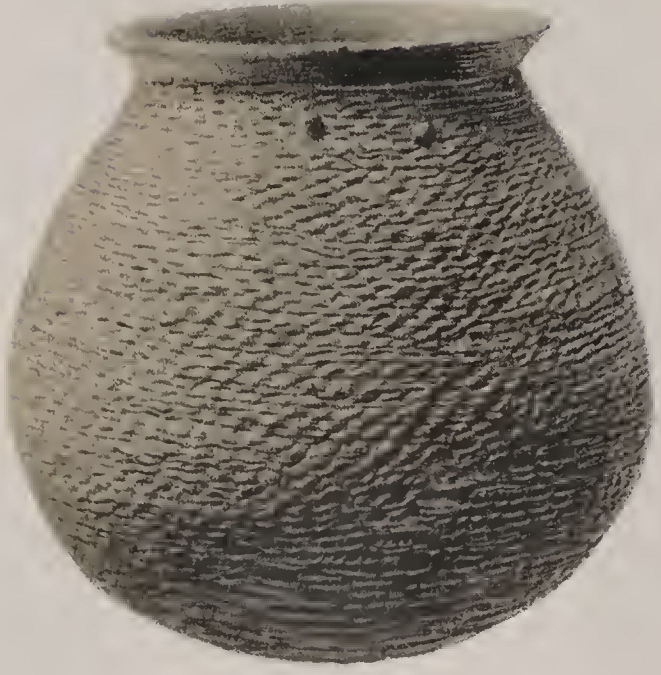
For making vessels of circular form the potter's wheel was used by advanced peoples in all times until the introduction of casting and is still used very largely. This implement is a revolving horizontal disk on which the lump of clay is thrown, and this lump is shaped by revolution. The disk is revolved by a treadle which the workman operates with his foot and which is turned through a few degrees of the circle or more rapidly through the whole circle, as conditions require. Into the lump of clay the potter thrusts his thumbs, and by drawing them upward and outward he rapidly reduces the whirling mass to the form of a vessel. The inside is smoothed by pressing a wet sponge against the surface and the outside by a strip of leather, while the vessel is revolving. It is now released from the disk by means of a piece of wire which cuts the clay from the wood, and is then put on a board to dry; when dry the form may be perfected by turning in a lathe, not unlike the implement used for wood turning.

The use of jiggers and jollies has greatly increased the rapidity and regularity with which vessels may be shaped. A jigger is a machine carrying a revolving mold in which the clay is shaped by a former which is brought down and held firmly within the mold, the clay having been carefully spread by hand upon the inside surface of the mold. The jigger is used for deep dishes, vases, and the like. The jolly is a similar contrivance used in forming plates and other flat pieces. Jugs and bottles are commonly made in two parts and cemented together before the clay is dry. The clay is usually allowed to dry in the mold, and as the water is drawn off the clay shrinks so that it does not cling to the mold. Such additions as spouts and handles are

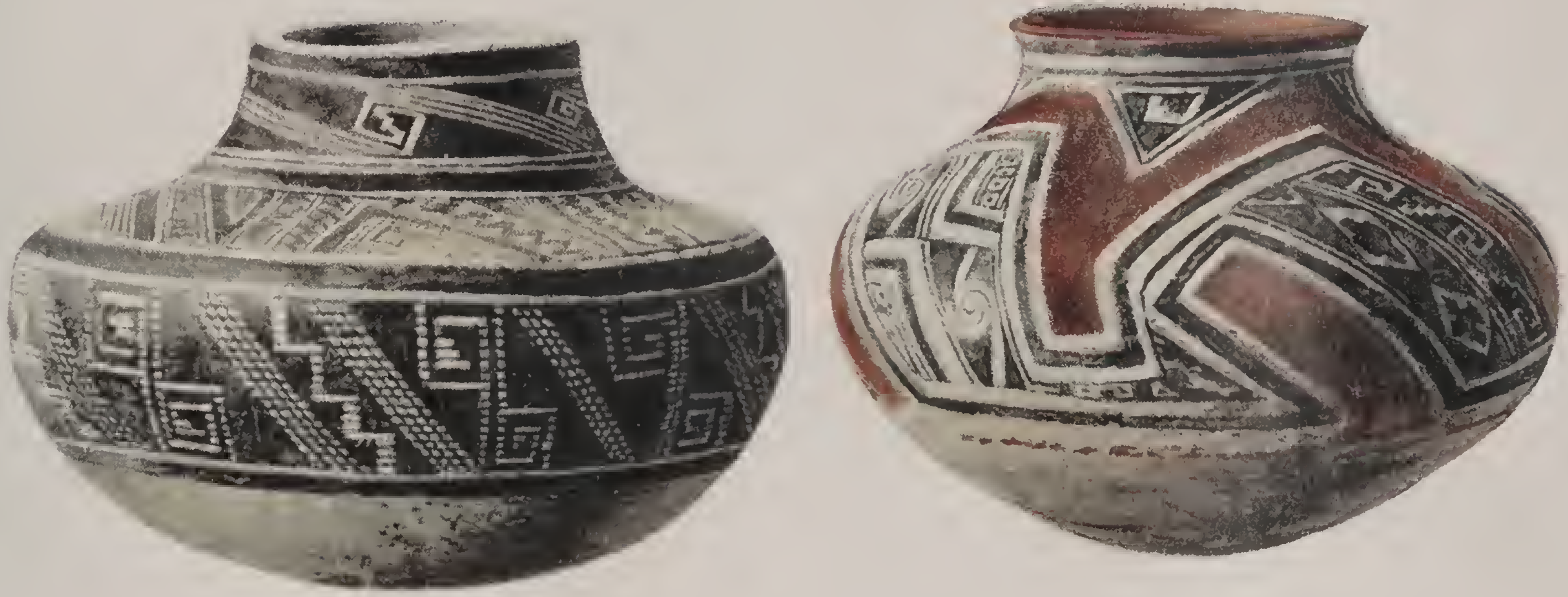
ABORIGINAL POTTERY-UNITED STATES



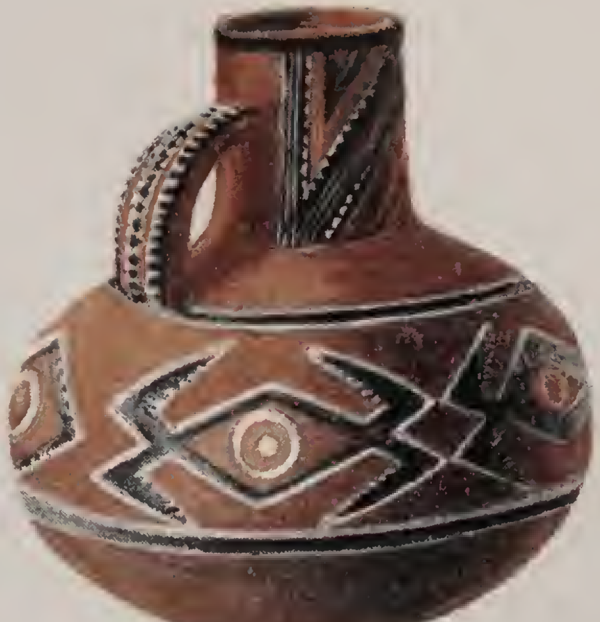
FROM A MOUND IN ARKANSAS



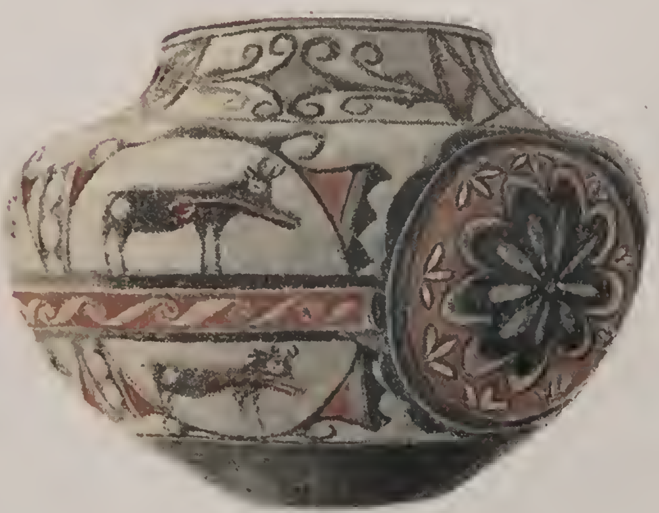
FROM A CLIFF DWELLING IN ARIZONA



ANCIENT PUEBLO TYPES



FROM A RUIN IN ARIZONA



MODERN ZUÑI IN ARIZONA

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molded separately and cemented with moist clay before the pieces dry.

Casting is employed in making very fine ware. The plaster-of-Paris mold is filled with liquid clay which is allowed to stand until a thin shell is formed around the surface of the mold, after which the rest of the clay is poured out; this process is used for egg-shell porcelain, such as Parian and Belleek china. The making of these plaster-of-Paris molds is a matter of great delicacy. The model having been designed, a mold is made from it which is divided so that it may be easily removed from the clay. This is called the block mold. From this there is made a cast which is, of course, a replica in plaster of the original model, and from this the working molds are made. After the pieces of pottery have been formed, they are taken to the drying stove, where they are exposed to a heat of about 85° F. When considered dry they are placed in great earthenware vessels, called seggars or saggars, which are so shaped that they can be piled one upon another to a great height. The seggars are often made large enough to hold each a number of pieces of the unbaked pottery, and, as these would adhere if they touched one another, a number of curiously shaped pieces of baked clay are used, upon which they rest: these are called cockspurs, triangles, stilts, etc. Thus, each seggar forms a small oven by itself, and by this means the unequal heating of the pieces is prevented, and they are also protected from smoke. A pile of seggars is called a bung, and there may be 48 or 50 bungs in the charge of a kiln. When all this is arranged the furnaces, of which there are several to each kiln, are lighted. The firing requires from 24 to 50 hours, after which the ware is allowed to cool very slowly. See KILN.

The articles are now in the state called biscuit and still require glazing and perhaps decorative painting and gilding. (For the various kinds of glazing, see STONEWARE; FAÏENCE; MAJOLICA; ETC.) Many mixtures are used, the essential thing being that the glaze and the body shall be of the same general nature in order that they may contract evenly during the firing. The result of uneven shrinking is seen in the cracking of the surface, called crazing, and the crackle of Oriental porcelain and pottery is deliberately produced in the same way. The different glazes are composed of litharge, flint, feldspar, etc., mixed with white clay, applied in the form of slip. The glazing materials are triturated with water, with the same care and by similar means to those employed in forming paste, and are reduced with water to the same milklike liquidity. Each workman has a tub of the glaze before him; and as the articles of biscuit ware, either with or without decorations, are brought to him, he dips them in the glaze so as to insure a uniform coating over them, and by nice management he prevents any large drops or accumulations on one part more than another. The porous biscuit ware rapidly absorbs the moisture and dries up the thin film of glaze on the surface of the articles, which are again placed in seggars and carried to the glaze kiln, where they undergo another firing, which melts the glaze and converts it into a perfectly transparent glass, and, except when tin enters into the composition, renders any pattern previously printed upon the biscuit very plain. The temperature in the glaze or enamel kiln is increased very gradually and is kept up for about 14 hours, after which it is allowed to cool slowly, and the articles are taken out completed. So far this description has applied to the manufacture of pottery for general purposes, but when it is applied to more costly and artistic works very special arrangements are required.

Decoration by means of painting may be applied to pottery on the biscuit, or on the unfired enamel, or on the already fired enamel or glaze. The method is limited in its scope, but very permanent. The difficulty is to find colors that will stand the great heat required for firing the glaze. Practically the only color used under the glaze for a hard glazed ware is cobalt blue, but for the softer glazes the oxides of many metals, as copper, iron, and gold, may be used.

Painting on the unfired enamel produces some of the brilliant varieties of faïence. Painting upon the glaze, allowing of almost any combination of colors, is the more common practice in ceramic art generally. Painting under glaze requires great skill and experience, for the appearance of the pigments as they are laid by the painter is altogether different from the resulting effect after the firing. The decoration may be applied with a brush or by a transfer of printing. In the latter process the designs are engraved on copper plates; the colors are specially prepared with a printing oil, and the designs printed on a wet tissue paper, which in turn is laid upon the ware and transfers its pattern to the surface of the clay. After the paper has been washed off, the decoration may be touched up with a brush, if necessary.

History. 1. Unglazed pottery includes the rude, slightly fired wares of primitive races. In general, primitive pottery is made from surface soil rather than from the finer and purer grades of clay. Naturally the ware produced from such material is coarse and thick-walled. Some of the crudest types of ware are molded in baskets—indeed, archæologists find good reason for supposing that some of the earliest pottery was nothing more than an earthen lining for a basket in which corn or other grains were parched by shaking them with live coals until the material was more or less completely baked. Sometimes the frames of wicker or basketry were burnt off in the firing in such manner as to leave permanent impressions of the framework. This type abounds in mounds and on other prehistoric sites in the central and southeastern United States. In the arid regions, not only in the United States and Mexico but in South America and on other continents, the early ware was improved far beyond this primitive type, in form and finish as well as in material and manufacture. Some of the aboriginal American ware is graceful in form, elaborate in decoration, and perhaps finished with a more or less siliceous slip; though neither the true clays nor the potter's wheel were known to the pre-Columbian natives. Frequently the forms were fantastic, the utensils grading into elaborate symbolic moldings and votive effigies. In beauty of form and color effects, as well as in elaborateness and delicacy of the symbolic designs, aboriginal American pottery may be said to have culminated in the Pueblo region in the southwestern United States and northern Mexico; some of the pieces from this region (as shown in the accompanying plate) attest a fairly advanced stage in artistic development. The primitive methods of firing are extremely simple. Ordinarily either a single piece or a small lot is fired outdoors in a shallow pit with the commonest fuel.

The rough red dishes and pots made by peoples of prehistoric time and by tribes of low civilization all over the world are usually of a substance similar to common flower pots even when they are prettily modeled as to form and painted with circles and lines. The coarse terracotta vessels of Egypt, Greece, Rome, Crete, and Cyprus, the sizes of which vary from lamps and toys weighing an ounce or two up to huge vases intended evidently for the storage of grain, oil, wine, etc., which may sometimes contain 100 gallons; the black earthenware with relief decorations imitating metal work, as produced by the ancient Etrurians, from about the seventh to the fifth century B.C.; the finely modeled figurines of Tanagra, Greece; the grotesque pottery of the ancient Peruvians and Mexicans—may all be placed in this group.

2. Varnished or lustrous pottery was produced in Greece from about the fifth to the third century B.C. Instead of being covered with a true glaze or enamel, it possesses a lustrous or glossy black surface of considerable hardness, the exact nature of which is not definitely known. Greek vases, other than archaic wares, are of two kinds, viz., those painted with black figures on the red ground of the ware, and those with red figures reserved in a painted black ground. One variety of lekythi, or oil cruets, is coated with a white engobe, upon which the decoration has been painted in red and black, which at one time was probably firmly fixed, but which to-day is very perishable, having a marked tendency to flake off.

To this group of pottery may be assigned the fine-grained polished ware, of sealing-wax-red color, decorated with embossed designs, known as Samian or Aretine ware, which dates from about the second century B.C. to the third century A.D. This fictile fabric was believed to have been first made on the island of Samos and also at Arezzo, Italy, and elsewhere, and has been found on many Roman sites, particularly in Gaul, Great Britain, and Germany.

3. Glass-glazed pottery was produced in Egypt, Babylonia, Persia, and countries bordering on the Mediterranean Sea. The ware consists of a soft, gritty white body, covered with a transparent siliceous or glassy glaze of great hardness. In Egypt the glaze was colored with metallic oxides, which rendered it opaque when applied thickly, which led the early ceramic writers to the erroneous conclusion that it was of a stanniferous nature. A true glass glaze was also used by the Babylonians for many centuries previous to the Christian era. A similar glaze has been employed by the Persian potters from about the ninth century or earlier to the present time. The pottery and tiles of Syria, Turkey, Asia Minor, and Rhodes present the same characteristics, but are also distinguished by decorations in a peculiar dark-red enamel, which has been applied thickly and appears to be slightly in relief. A variety of pottery from Rakka, Mesopotamia, which in recent years has become well known to collectors, is ornamented with black designs and frequently inscribed on a greenish ground, the glass glaze having become iridescent through long burial in the earth. In Spain the art of glazing with glass was practiced to some extent as early as the fifteenth century, having probably been introduced from Persia. At Seville and perhaps other centres, in the sixteenth century and later, vast quantities of tiles, in the so-called *cuerda seca* and *cuenca* styles, were manufactured for architectural purposes, the raised or sunken designs being covered or filled with colored glass, in combination with stanniferous white enamel, which was used as a background. Plates and large plaques, decorated in the same manner, with human heads, animals, fabulous monsters, and leaf patterns, were at one time thought to have been produced at Puente del Arzobispo, and were known by that name, but are now generally attributed to Seville and to the fifteenth century.

4. Tin-enameled pottery was, it is now generally conceded, first produced by the Saracens, who were making tin-enameled and lustred ware in Egypt as early as the eleventh century. A little later they introduced the art into Persia, as is proved by the discoveries of pottery vessels and star-shaped and cruciform tiles at Rhages, Sultanabad, and Veramin, many of which bear dates of the twelfth and thirteenth centuries. These wares reveal in their forms and decorative treatment a strong Saracenic influence and are entirely different from the glass-glazed wares of undoubted Persian origin. Wherever the Saracens penetrated they carried with them the arts of enameling with tin and decorating with metallic lustres. After these arts had been taken into northern Africa they were carried into Spain by the Moors in the fourteenth century. The enameled pottery of Malaga at that time was purely Moorish in spirit and was coated with an exceedingly hard opaque white enamel of which oxide of tin was an important constituent, while the decorations were in blue, heightened by iridescent lustres. Of this purely Moorish product the Alhambra vase at Granada is the most celebrated example. In the fifteenth century the influence of the native Spanish potters began to assert itself, and mock-Arabic and Christian inscriptions, Christian symbolism, and heraldic shields of noble families were introduced, which resulted in the development of Hispano-Moresco pottery. Gradually, as the Saracenic influence waned, the glaze of this ware became modified by the decrease of tin and the increase of lead, which latter was applied over white slip.

From Spain the art of enameling with tin was taken to Italy, where was made a highly decorative pottery, known as majolica, from the name of Majorca, an island lying between Spain and Italy, where the ware was believed to have originated. This artistic product was manufactured at many places, but at only three (Gubbio, Pesaro, and Diruta) was lustring attempted. Lucca della Robbia was the first to bring tin enamel to perfection in Italy, using it on his altarpieces and figure panels in the fifteenth century (about 1438).

From Italy the use of stanniferous enamel spread to France; to Holland, where the ware was called Delft, from the name of the town where it was made; to England, where it was known by the same name; to Sweden, Denmark, Belgium, and Hungary, and to other parts of Europe. In the seventeenth and eighteenth centuries majolica was also produced extensively in Mexico, under Spanish influence.

5. Lead-glazed pottery is perhaps the largest division of ceramic manufactures, its production having extended into almost every country of the civilized world. Lead, in various forms, produces a glasslike, transparent glaze, which in

its simpler combinations is extremely fusible and so soft that it can be easily scratched. It has been used in the Orient, the nearer East, and throughout Europe and the United States. A green pottery was made in China during the Han dynasty (202 B.C.–220 A.D.), which was the earliest lead-glazed ware of which we have knowledge. Lead glaze is applied to the most ordinary earthenware, such as red clay cooking utensils, and to the most elaborate examples of the potter's skill. Of the coarser kinds of lead-glazed pottery the slip-decorated and sgraffito red wares of England, Germany, Switzerland, and Holland are the most pretentious, the first variety being ornamented by pouring liquid slip through a quill attached to a cup and tracing the designs in white on the red ware; the second being decorated by covering the red surface with a thin layer of white slip and scratching the designs through to expose the red clay beneath, a covering of lead glaze being afterward in each case applied. The large circular dishes of Staffordshire, with slip-traced figures, animals, and dates, are popularly known as Toft ware, since the names of Thomas and Ralph Toft frequently occur on the best examples. Earthenware of a similar character, with figures, tulip designs, inscriptions, and dates, was extensively produced in eastern Pennsylvania by the German settlers between 1730 and 1850.

In the sixteenth century (c.1520–50) a lead-glazed pottery of the highest artistic excellence was made in France, known to-day as Henri Deux ware, for the reason that many of the pieces are embellished with the cipher of Henry II, and as faïence d'Oiron, because it was thought to have been produced at the castle of Oiron, near Thouars. Its principal characteristics are a fine white body, intricate strapwork patterns, composed of inlaid clays of different colors, and graceful modeling of forms and their adjuncts. A little later (c.1560–80) Bernard Palissy, of Saintes, France, was producing his celebrated *rustiques figulines*, as the plaques and dishes enriched with casts of reptiles, fishes, and shells were termed. This ware was made of white clay and glazed with lead.

Mezza majolica is of an entirely different character from true majolica, since it possesses a soft lead glaze applied over a wash of white slip, instead of being enameled with tin. It was the prototype of the sgraffito wares which later were manufactured throughout the greater part of Europe and in the United States.

Another variety of lead-glazed pottery, variously known as cream-colored ware, creamware, and Queen's ware, has been produced extensively in England and to a lesser extent by English potters in France. To this group belong the tortoise-shell or Whieldon ware; the melon, cauliflower, and pineapple wares; copper, silver, and rose lustred wares; Staffordshire figures; Liverpool and Staffordshire print-decorated pottery; "mocha" and green glazed wares, the openwork, and basketry designs of Wedgwood, the Leeds pottery, and many other establishments.

In carrying out the classification here employed, a difficulty is sometimes encountered when the exact composition of the glaze is unknown, since special preparations have been used by different potters, which vary greatly in materials and their proportions. In the division of lead-glazed pottery we are justified in grouping those wares whose glazes, while possessing the principal characteristics of ordinary lead glaze, have been rendered exceedingly hard by the addition of borax, flint, or feldspar. To this class belong many of the brown glazed potteries of Japan; the slip-decorated dishes of Brislington and Shropshire, England, and the Flint enameled pottery of Bennington, Vt., and Baltimore, Md., to which may be added the artistic wares of the Rookwood Pottery of Cincinnati and the green-glazed Grueby faïence of Boston. These American achievements, having more or less vitrified bodies, form in reality a connecting link between soft pottery and unglazed stonewares.

Bibliography. A very great number of books have been devoted to the general subject of ceramic art. The bibliographies given under all the special terms, for which see the first paragraph of the above article, should be examined. In this place will be named some general treatises, and works especially devoted to ancient potteries, Egyptian and Greek, and to the wares of various countries.

Of general treatises, Jacquemart, *History of the Ceramic Art* (Eng. ed., London, 1877), which is often cited; Friedrich Jaennicke, *Grundriss der Keramik* (Stuttgart, 1879), with illustrations and reproductions of makers' marks; Marryat, *Pottery and Porcelain* (3d ed., London, 1868), a general treatise on modern ware. For ancient pottery, see Samuel Birch, *History of Ancient Pottery, Egyptian, Assyrian, Greek, Etruscan, and Roman* (London, 1873); Ris Paquot, *Histoire général de la faïence ancienne française et étrangère* (Paris, 1876); H. B. Walters, *History of Ancient Pottery, Greek, Etruscan, and Roman, Based on the Work of Samuel Birch* (New York, 1905). Among the costly books especially devoted to the Greek painted vases are: Bendorf, *Griechische und sizilische Vasenbilder* (Berlin, 1868); Lau, *Die griechischen Vasen* (Leipzig, 1877); Dumont and Chaplain, *Les céramiques de la Grèce propre* (Paris, 1888 et seq.). See also Morse, *Catalogue of the Morse Collection of Japanese Pottery* (Cambridge, 1901); Solon, *French Faïence* (London, 1903); Burton, *English Earthenware and Stoneware* (ib., 1904); E. A. Barber, *The Maiolica of Mexico* (Philadelphia, 1908); id., *Pottery and Porcelain of the United States* (3d ed., New York, 1909); Solon, *Ceramic Literature* (London, 1910); Van de Put, *Hispano-Moresque Ware of the XV Century* (2d ed., ib., 1911); E. A. Barber, *Ceramic Collector's Glossary* (New York, 1914).

POTT'HAST, EDWARD HENRY (1857–). An American landscape painter. He was born in Cincinnati and studied at the academy there and in Antwerp, Munich, and Paris. His landscapes are realistically and solidly painted, with a broad and sincere presentation of nature. Notable among them are: "Winter in the Suburbs" and "A Hazy Day" (1907); "Grand Canyon" (1911); "Sunlight and Shadow" (1913); "A Holiday" and "A Day at the Seashore" (1915). His "Dutch Interior" is in the Cincinnati Museum. Potthast was elected in 1906 to the National Academy, from which he had received the Clark prize in 1899. Silver medals were awarded him at the St. Louis (1904) and San Francisco (1915) expositions, and he was honored by membership in the National Institute of Arts and Letters.

POTTIER, pô'tyå', EDMOND (1855–). A French archæologist, born at Saarbrücken, Prussia, and educated at the Ecole Normale, Paris, and (1877–80) at the French School of Classical

Studies in Athens. Then he assisted Veyries and Reinach in the excavations at Myrina in Asia Minor and began to specialize in Greek terra cottas. He taught at Rennes and at Toulouse for two years (1884–86), had a course in archæology at the Beaux-Arts, and became adjunct curator and assistant instructor in Oriental archæology and antique ceramics at the Louvre. He was elected to the Académie des Inscriptions et Belles-Lettres in 1899. Besides many contributions to archæological journals and to the Daremberg and Saglio *Dictionnaire des antiquités,* Pottier published catalogues of the ceramic collections in the Louvre; *La nécropole de Myrina* (1886), with Reinach; *Les statuettes de terre cuite dans l'antiquité* (1890); *La peinture industrielle chez les Grecs* (1898); *Douris et les peintures de vases grecs: étude critique* (1905). His later literary work was done largely for periodicals.

POT'TINGER, Sir Henry (1789–1856). A British diplomat, administrator, and soldier, born at Mount Pottinger, County Down, Ireland. Becoming a cadet in 1804 in the East India Company's military service, five years later he was commissioned to explore the region between their frontier and Persia. As a result he published *Travels in Beloochistan and Sinde* (1816). He served during the Mahratta War, had charge of a mission to Sind in 1831, in 1836–40 was political agent there, and was made Baronet in 1840. In 1841, during the Opium War between Great Britain and China, he was sent as Ambassador to the latter country, and after the capture of Amoy and several other important towns he in 1842 concluded a peace which opened five of the principal Chinese ports to British merchants. He was appointed the first British Governor of Hongkong, and on his return to England the next year was made an Imperial Privy Councilor and was granted a pension of £1500. In 1846 he was Governor of the Cape of Good Hope, and in 1846–54 Governor of Madras.

POT'TO (African name). A small brownish-gray West African lemur (*Perodicticus potto*) of the loris group, remarkable for having a distinct though rudimentary tail and distinct index fingers. Its body is 6 inches long, and it has the sluggish habits of its relatives. The name has been transported to South America by the negroes and there applied to the kinkajou, a small relative of the raccoons.

POTTS, James Henry (1848–). An American Methodist Episcopal clergyman and editor, born in Woodhouse, Norfolk County, Ontario. He graduated from the Mayhew Business College (Albion, Mich.) in 1866, having as a boy served in the Civil War for two years. In 1869 he entered the ministry, but his main work was in religious journalism—from 1877 to 1885 as assistant editor of the *Michigan Christian Advocate* of Detroit and thereafter as editor in chief. He was a member of various conferences of his denomination. His principal writings are *Living Thoughts of John Wesley* (1891) and *Black and White, or the Saloon v. Temperance* (1908).

POTTS, John (1838–1907). A Canadian clergyman. He was born in County Fermanagh, Ireland, and emigrated to the United States in 1855. After a few years' residence in the South he went to Ontario and engaged in business, then studied for the Methodist ministry and was ordained in 1861. He filled prominent pulpits in London, Hamilton, Montreal, and Toronto, but in 1886 retired from regular pastoral work on being appointed General Secretary of Education for the Methodist Church. Potts was an eloquent preacher, strongly evangelical in sympathy and doctrine, and highly popular in his own and other Protestant denominations in Canada. He was influential in effecting the union of the five different bodies which now constitute the Methodist Church of the Dominion, and took part also in federating Victoria University (Methodist) with the Provincial University at Toronto.

POTT'S DISEASE, or Spinal Caries. Tuberculosis of the bodies of the spinal vertebræ, named after Dr. Percival Pott (q.v.), who first accurately described the condition and its nature. In this affection as the tuberculous tissue replaces the normal bone tissue of the vertebræ, softening results together with marked deformity of the spine. This deformity is usually seen as an angular projection or hump in the upper part of the back. It is caused from absorption or erosion of the bodies of the vertebræ, allowing them to be pressed more closely together, which in turn causes their sharp spinous processes to project posteriorly beyond the line of the spines above and below the affected area. Pott's disease develops in childhood and youth, while the body is undergoing rapid growth. The formation of pus is a not infrequent accompaniment of tuberculosis in the spinal region, as in other localities, and this pus often collects into an abscess, known as *cold abscess* (see Abscess), from the fact that the pus is sterile and produces no inflammatory reaction. These abscesses sometimes point in the back adjacent to the vertebræ and often occupy the posterior mediastinal space (see Chest and Pleura), where they are known as *mediastinal abscesses.* Occasionally the pus in spinal caries burrows downward beneath the muscles of the back and may appear in the lumbar region, constituting a *lumbar abscess,* or following the psoas muscle it may pass forward through the pelvis and appear near the attachment of that muscle in the groin—*psoas abscess.* When the disease is located in the cervical vertebræ and an abscess forms, it may point to the pharynx. After recovery takes place in tuberculosis of the vertebræ, ankylosis is present. In the treatment of Pott's disease constitutional measures must receive the most thorough consideration. General hygienic measures must be combined with abundance of fresh air, nutritious food, tonics, massage, and as great amount of exercise as the conditions permit. The surgical treatment consists of immobilization of the spinal column by means of frames, the plaster-of-Paris jacket, the jury mast, etc. Such measures attain their results by giving rest to the diseased parts, allaying irritation, preventing attrition and crushing of softened bones, and in limiting the amount of deformity after the disease process has become quiescent. See Orthopedics.

POTT'S FRACTURE. An injury to the ankle consisting in a fracture of the fibula just above the malleolus, together with a rupture of the internal lateral ligament, named after Dr. Percival Pott (q.v.). The tip of the internal malleolus may also be broken. Pott's fracture is a very serious injury even when uncomplicated, since the structures involved take part in the formation of the ankle joint, which has to bear the entire weight of the body. The fracture usually results from excessive eversion of the foot, in circumstances where this member is caught or wedged tightly and the body falls to the injured side.

POTTS′TOWN. A borough in Montgomery Co., Pa., 40 miles by rail northwest of Philadelphia, on the Schuylkill River and on the Pennsylvania and the Philadelphia and Reading railroads (Map: Pennsylvania, K 7). It has two parks, the well-known Hill School, a public high-school library, and two public hospitals. The centre of a productive farming and dairying country with considerable mineral wealth, Pottstown is an important manufacturing borough, its iron and steel interests being very extensive. There are large rolling mills, furnaces, nail works, textile mills, bridge works, agricultural-implement works, boiler and machine shops, foundries, and manufactories of bricks, silks, shirts, hosiery, etc. The various industries, according to the census of 1909, represented an aggregate invested capital of $9,961,000, and had a production valued at $12,505,000. Pottstown was laid out in 1752–53 and named Pottsgrove in honor of its founder, a name that was retained until the incorporation of the borough in 1815, when its present name was adopted. In 1888 the limits of the borough were considerably extended. Pop., 1900, 13,696; 1910, 15,599; 1915 (U. S. est.), 16,601.

POTTS′VILLE. A city and the county seat of Schuylkill Co., Pa., 36 miles north by west of Reading, on the Schuylkill River and on the Philadelphia and Reading, the Pennsylvania, the People's, and the Lehigh Valley railroads (Map: Pennsylvania, J 6). It is situated in a remarkably picturesque region, which is much frequented by tourists. The county courthouse is the most prominent building in the city, and there are also the county jail, a public library, a beautiful park, and a public hospital. Pottsville is surrounded by the productive anthracite fields of the Schuylkill coal basin and is an important coal mining and shipping centre. Its mechanical industries, too, have been developed to a considerable extent, having, according to the census of 1909, invested capital to the amount of $13,982,000, with products valued at $9,138,000. The more important establishments include a large steel plant, shops of the Pennsylvania and the Philadelphia and Reading railroads, manufactories of wood-working machinery, shirts and shoes, knitting mills, textile and silk mills, etc. The commission form of government has been adopted. Pottsville was settled about 1800, was laid out as a town by John Pott in 1816, and in 1828 was incorporated as a borough. It became the county seat in 1851. Pop., 1900, 15,710; 1910, 20,236; 1915 (U. S. est.), 22,028.

POTTSVILLE CONGLOMERATE. The name given to a hard, siliceous conglomerate composed of quartz pebbles and sand and occurring at the base of the lower coal measures. In the central portion of the Pennsylvania anthracite region it has a thickness of 800 to 1700 feet, but is less than 300 to the northward and westward. In New York it is known as the Olean conglomerate. See Carboniferous System; Coal.

POTVIN, pȯ′văɴ′, Charles (1818–1902). A Belgian author, born in Mons. He studied at Liége, entered political journalism as an editor of *La Nation*, and founded *La Belgique Démocratique* (1849) and *Revue de Belgique* (1862). Potvin lectured on the history of literature in the Royal Industrial Museum for some time, was elected to the Belgian Academy in 1881, and in 1883 became curator of the Wiertz Museum in Brussels. He wrote such poems as *Poésies et amours* (1838), *Le chansonnier belge* (1850), *La Belgique* (1859); on politics: *L'Eglise et la morale* (1858, under the pseudonym Dom Jacobus), and *La nationalité belge* (1859); on history: *Albert et Isabelle* (1861), *Le Jubilé d'un faux miracle* (1874, under the pseudonym Dom Liber), and *De la civilisation en Belgique* (1885); in literary criticism: *De la corruption littéraire en France* (1873) and *Histoire des lettres en Belgique* (1882); in Old French: *Baudouin de Condé* (1863) and *Perceval le Gallois* (1866–72); and *Le Roman de Renard* in modern French verse (1860).

POUCHED DOG. See Dasyure.

POUCHED MOUSE, or Pouched Rat. Any small rodent with well-developed cheek pouches, especially in America a pouched or pocket gopher (q.v.), or one of the smaller mouselike animals of the family Saccomyidæ. In Australia the name is applied to a marsupial (genus *Thascologale*). It occurs over the whole of Australia and New Guinea, together with the adjacent islands. It is completely arboreal and insectivorous in its habits. It appears in the Australasian region to occupy the place held in India and adjacent countries by the tree shrews (*Tupaia*) and in South America by the smaller kinds of opossum. The largest of the 13 known species does not exceed a common rat in size. Whereas in all the Australian species the fur of the back is not striped, the majority of the Papuan representatives of the genus have striped backs. See Gopher; Pocket Gopher; and Plate of Gophers, Lemmings, and Marmot.

POUDRE BARYTIQUE. See Explosives.

POUDRETTE, po͞o′drĕt′ (Fr., small, fine powder). A name apparently first applied to a dry pulverulent manure prepared from the sediment from sewage-settling basins at Montfaucon, near Paris. The term is now applied to any dry mixture of night soil or sewage sludge with absorbent substances, such as charcoal, peat, gypsum, etc. It contains comparatively small amounts of the actual fertilizing constituents, unless, as is sometimes done, it is mixed with more concentrated fertilizing materials, such as dried blood, phosphates, potash salts, etc. See Fæces.

POUGHKEEPSIE, po-kĭp′sĭ. A city and the county seat of Dutchess Co., N. Y., 74 miles north of New York City, on the east bank of the Hudson River, on the New York Central and Hudson River and the Central New England railroads, and connected by ferry with the West Shore Railroad (Map: New York, B 1). A cantilever bridge, completed in 1889 and rebuilt in 1904, bears the New Haven road over the Hudson. The city lies on a plateau about 200 feet above the river and on the slope to the river. It is well known as the seat of Vassar College (q.v.), whose fine buildings and grounds are east of the city. It has also a number of schools for secondary education and the Eastman Business College. The Adriance Memorial Library contains more than 40,000 volumes. Besides the Hudson River State Hospital for the Insane, 2 miles north of Poughkeepsie, there are the Vassar Brothers Institute, Pringle Memorial Home, Vassar Brothers' and St. Francis hospitals, the Riverview Military Academy, a high school, and Columbus Institute. College Hill Park contains 100 acres and commands a fine view. The annual intercollegiate regatta is held on the Hudson at Poughkeepsie late in June. There are important mowing-machine works, horseshoe and cream-separator factories, foundries and machine shops, and manufactories of shoes, underwear, patent medicine, plows, buttons, tobacco, cigars, chairs, woodenware, window blinds, etc. The government is administered under a revised charter of 1900, which provides for a mayor, elected every two years, and a unicameral council. The majority of administrative officials are appointed by the mayor, whose nominations of members of the board of health, however, are made with the consent of the council. The Dutch made a settlement about 1698 on the site of Poughkeepsie. During the Revolutionary War it was an important base for the Continental armies. After 1778 it was the State capital, and here in 1788 met the State convention which, under the leadership of Alexander Hamilton, ratified the Federal Constitution. The village was incorporated in 1799 and a city charter was granted in 1854. Pop., 1900, 24,029; 1910, 27,936; 1915 (State census), 32,281. Consult E. Platt, *Eagle's History of Poughkeepsie* (Poughkeepsie, 1905).

POUGIN, pōō′zhăN′, Arthur (1834–). A French musical and dramatic critic and writer. He was born at Châteauroux (Indre) and studied music at the Paris Conservatory under Alard (violin) and Reber (harmony). In 1855 he became conductor at the Théâtre Beaumarchais, and afterward leader at Musard's concerts. He was also subconductor at the Folies-Nouvelles. From 1860 to 1863 he was first violin at the Opéra Comique. He was in turn *feuilletoniste* to *Le Soir*, *La Tribune*, *L'Evénement*, and *Le Journal Officiel*, besides being a frequent contributor to all the important French musical periodicals. He is a prolific writer and a sound critic, his biographical sketches being especially sympathetic. His work in connection with Fetis's *Biographie universelle*, for which he prepared a supplement (2 vols., 1878–80), has, however, been found to be lacking in thoroughness. He edited also the new edition of Clément and Larousse's *Dictionaire lyrique*.

POUGUES-LES-EAUX. See Nevers.

POUILLET, pōō′yȧ′, Claude Servais Mathias (1790–1868). A French physicist, born at Cusance (Doubs). He was educated at the Ecole Normale, where later he was an instructor. He became professor of physics at the Collège Bourbon, then at the Ecole Polytechnique, and later of the Faculté des Sciences. In 1829 he was elected subdirector and in 1831 director of the Conservatoire des Arts et Métiers. In 1849 he resigned his various positions and devoted himself to the study of physics. Pouillet is best known as the author of a textbook of physics which was translated into German by J. H. J. Müller and has passed through many editions; as the inventor of the tangent and sine galvanometers; and for his work on solar radiation, in the course of which he invented a form of pyrheliometer which is still in use. His other work in physics was wide and included such subjects as the measurement of high and low temperatures, measurements of extremely short intervals of time, the latent heat of vapors, etc.

POUILLET, Eugène (1835–1905). A French lawyer, born in Paris. He was admitted to the bar in 1858, and became known as an authority in patent and copyright law. In 1895 he opened, in the Palais de Justice, free consultation offices for the poor. He appeared in numerous important cases, and published a valuable series of works, including such titles as: *Traité théorique et pratique des dessins de fabrique* (1869; 3d ed., 1899); *Traité théorique et pratique des brevets d'invention et de la contrefaçon* (1870; 4th ed., 1899); *Traité des marques de fabrique* (1875; 5th ed., 1905); *Traité théorique et pratique de la propriété littéraire et artistique* (1879; 2d ed., 1893); *La convention d'union internationale* (1896). A collection of his verse appeared in 1872, *Poésies nouvelles*, under the pseudonym E. Pevéril.

POUJOULAT, pōō′zhōō′lȧ′, Jean Joseph François (1800–80). A French historian, born at La Fare (Bouches-du-Rhône). He went to Paris in 1826, assisted Michaud in his *Bibliothèque des croisades*, and traveled with him in the East. In the Constituent Assembly of 1848 and the Legislative Assembly of 1849 he was a member of the Right. His extreme royalism made him hostile alike to Louis Philippe and to Napoleon III, after whose coup d'état in 1851 Poujoulat retired from public life. He wrote: *La Bédouine* (1835), a novel crowned by the Academy; *Correspondance d'Orient* (1833–35), with Michaud; *Histoire de Jérusalem* (1840–42; 5th ed., 1865); *Histoire de la révolution française* (1848; 6th ed., 1877); *Souvenirs d'histoire et de littérature* (1868, 1886).

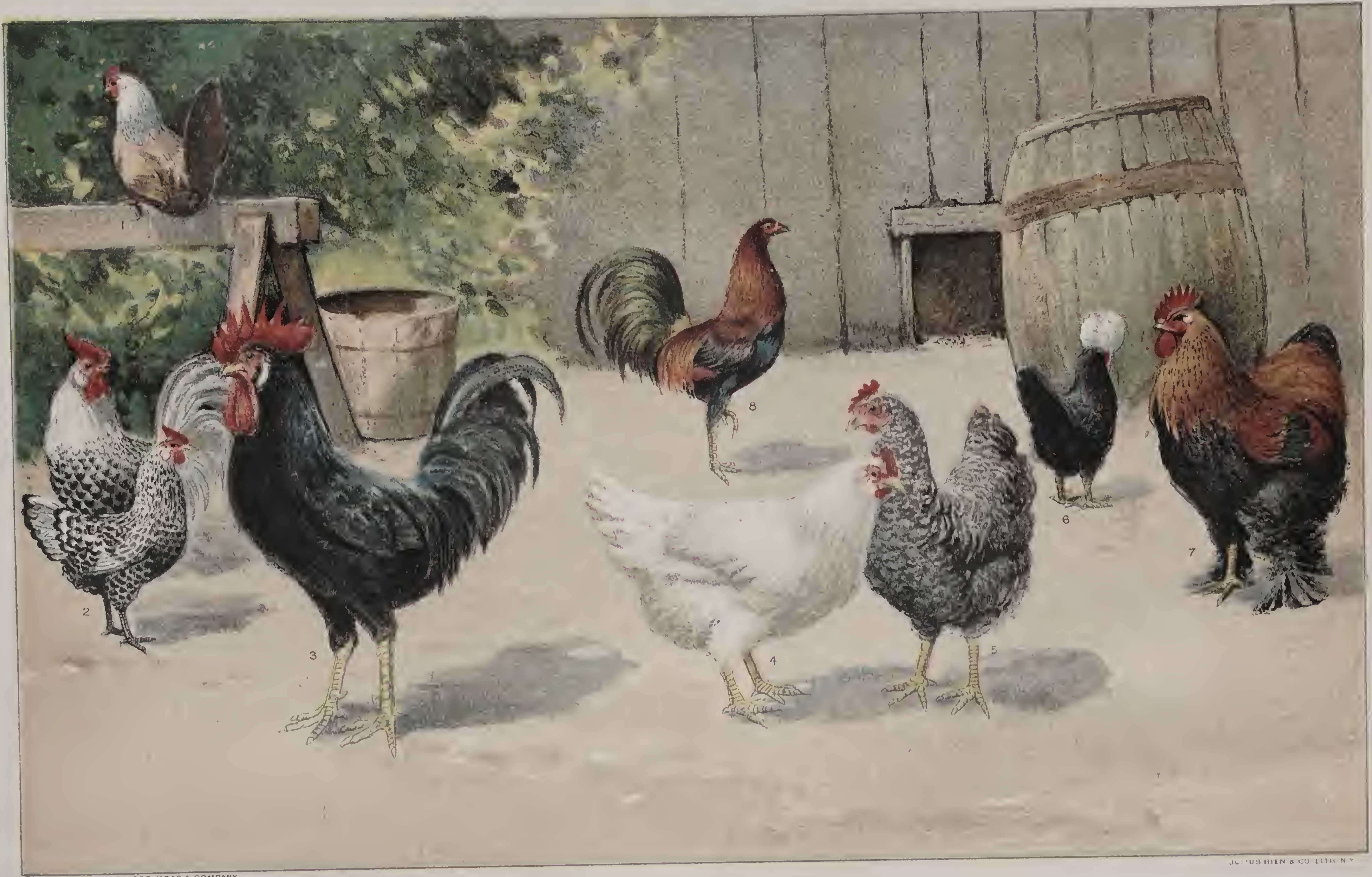
POULET, William. See Winchester, Marquis of.

POULPE, pōōlp. A French name for an octopus, specifically the common species of the Mediterranean (*Octopus vulgaris*). The term has passed into literature with a rather indefinite application to any cuttlefish, and sometimes even to polyps—a totally different sort of animal. The most conspicuous case of its use and misuse was by Victor Hugo in *The Toilers of the Sea*, where an animal is described under this name which combines characteristics and habits so totally diverse as to make the whole story zoölogical nonsense. See Cephalopoda; Octopus.

POULSEN, pōl′sĕn, Valdemar (1869–). A Danish electrical engineer and inventor, born in Copenhagen. In 1898 he invented the telegraphone (q.v.), and during the following years he worked out a system of radio (wireless) telegraphy. His first station was built in 1905 at Bagsværd, later ones at the Copenhagen navy yard and at Esbjerg. From all three of these points he communicated with a station at Newcastle, England, which had been built in accordance with his plans. He devised an arc generator for high-frequency oscillations, especially available for wireless telephony. See Wireless Telegraphy.

POULSON, pōl′son, Niels (1843–1911). An American ironmaster and philanthropist, born at Horsens, Denmark. As a boy he worked in a tobacco factory and as a mason's apprentice and later became an architect and builder at Copenhagen. Coming to the United States in 1864, he was a government architect at Washington, and then had charge of a department in the New York Architectural Iron Works. With Charles M. Eger Poulson formed a partnership in 1876; in 1897 the firm was incorporated as the Hecla Architectural Iron Works (New York), with Poulson as president. For the benefit of employees a free technical school was

DOMESTIC FOWLS



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1 DORKING HEN
2 SILVER-SPANGLED HAMBURG COCK AND HEN
3 BLACK MINORCA COCK
4 WHITE WYANDOTTE HEN
5 BARRED PLYMOUTH ROCK HEN
6 WHITE-CRESTED BLACK POLISH HEN
7 PARTRIDGE COCHIN COCK
8 RED GAME COCK

established by the company. In 1910 Poulson gave $100,000 to provide for an interchange of students and of lecturers between the United States and the Scandinavian countries. Scholarships for Scandinavian students were established at the Massachusetts Institute of Technology and at Harvard, Yale, and Columbia, and for American students at the universities of Copenhagen, Christiania, and Upsala. Poulson left his fortune of $500,000 to the cause of education. To administer this sum the American-Scandinavian Foundation and the American Scandinavian Society were established. Consult Dahlerup and Groth, in the *American Scandinavian Review*, vol. iii, no. 5 (New York, September–October, 1915).

POUL′TICE (from Lat. *puls*, Gk. *πόλτος*, *poltos*, porridge), or Cataplasm. A soft mass composed of substances such as slippery elm bark, meal, flaxseed, bread, herbs, or mustard, for application to the surface of the body. The mass is mixed with hot water and spread to the thickness of about ½ inch upon linen, cheesecloth, or even paper. Poultices may be employed for their heat alone or as vehicles for some therapeutic agent. In the early stages of an inflammation a poultice will assist nature in softening and absorbing inflammatory products, and when the inflammatory process has advanced they will hasten pus formation. Poultices of green soap are often employed before surgical operations to soften and sterilize the skin. Cold poultices, as those of layers of gauze, steeped in water and covered with rubber tissue or oiled silk, are sometimes applied to prevent inflammation and mitigate pain. One of the most satisfactory and cleanly poultices now in general use is the *cataplasma kaolini* of the United States Pharmacopœia; it consists of kaolin mixed with glycerine and antiseptics.

POULTNEY, pōlt′nĭ. A town in Rutland Co., Vt., 19 miles west-southwest of Rutland, on the Delaware and Hudson Railroad (Map: Vermont, A 5). It is the seat of the Troy Conference Academy (Methodist), and has slate quarries, shirt and farm-implement factories, and a machine shop. The water works are owned by the town. Pop., 1900, 3108; 1910, 3644.

POUL′TON, Edward Bagnall (1856–). An English zoölogist, born at Reading. He was educated at Jesus College, Oxford, in 1877–79 was demonstrator under Professor Rolleston in the anatomical department of the University Museum, and from 1880 to 1889 was lecturer in natural science and tutor in Keble College. He was also lecturer in natural science in Jesus College from 1880 to 1888. In 1893 he became Hope professor of zoölogy at Oxford. He was elected fellow of the Royal Society in 1889, and was president of the Entomological Society of London in 1903–04 and of the Linnean Society in 1912–13. In 1894 he delivered at Boston, Mass., a course of Lowell lectures on "The Meaning and Use of the Colors of Animals." Besides valuable special contributions his publications include: *The Colors of Animals* (1890), in the "International Scientific Series"; *Charles Darwin and the Theory of Natural Selection* (1896); *Essays on Evolution* (1908); *Charles Darwin and the Origin of Species* (1909); *Viriamu Jones and Other Oxford Memories* (1911).

POUL′TRY (OF. *pouleterie*, from *poulet*, *poulette*, *polete*, Fr. *poulette*, pullet, fowl, dim. of *poule*, from ML. *pulla*, hen, fem. of Lat. *pullus*, young animal, chicken). A collective name for useful domestic birds. It is sometimes limited to the domesticated gallinaceous birds—chickens, peafowl, guinea fowl, turkey, guan, and pigeon—but its ordinary use includes ducks, geese, swans, and all other birds reared for purposes of domestic economy. Under the influence of domestication the group has exhibited a great capacity for variation in externals, as color, combs, etc., and especially in size, as appears when the diminutive bantams are compared with great shanghais, and to this capacity for adaptation the usefulness of fowls is largely due. Consult: H. W. Weir, *The Poultry Book* (New York, 1905; new ed., ib., 1909); C. B. Davenport, *Inheritance of Characteristics in Domestic Fowl*, published by the Carnegie Institution (Washington, 1909); W. A. Lippincott, *Poultry Production* (Philadelphia, 1914); Edward Brown, *Poultry Husbandry* (New York, 1915); Raymond Pearl and others, *Diseases of Poultry: Etiology, Diagnosis, Treatment, and Prevention* (ib., 1915). See Fowl; Gallinæ; and the names of the various birds, as Duck, Turkey, etc.

POUND. See Weights and Measures.

POUND (variant of *pond*, from AS. *ge-pyndan*, to shut up, impound). An inclosure for the temporary confinement of stray animals. Where domestic animals stray upon the public highways, or upon the land of individuals, any person injured thereby may take possession of and impound them, i.e., detain them in a pound until the owner pays him for any damage they may have caused. A pound may be one established by law, known as a public or common pound; or, where there is no public pound, a person on whose land cattle or other domestic beasts stray may confine them in an inclosure on his own land, with the intention of thereby impounding them. In the latter case, the person so confining the animals is responsible for them. To obtain a release of the beasts the owner must pay him for their keep, as well as for the damage they have done.

Where cattle are taken to a public pound the person taking them should leave with the poundkeeper a certificate containing a brief statement of the cause of impounding and the amount of damages he claims. The poundkeeper then becomes responsible for the keep of the animals. The compensation of the poundkeeper is usually derived from fees, which must be paid by the owner before the poundkeeper is obliged to release them. In most of the United States either the poundkeeper or the person impounding the animals must give notice to their owner if he can be ascertained and found. If the owner does not redeem his animals within a time fixed by statute or, in absence of such provision, within a reasonable time after notice, the poundkeeper may advertise and sell the beasts, satisfy all charges against them, and hold the balance to the credit of the owner. Consult J. H. Ingham, *Law of Animals* (Philadelphia, 1900). See Impounding.

POUND, Ezra (1885–). An author of American birth who settled in England in 1907. He was educated at Hamilton College, from which he graduated in 1905, and at the University of Pennsylvania, where he specialized in Romance languages. In 1906–07 he traveled in Spain, Provence, and Italy. Pound became literary executor of Ernest Fenollosa. In prose he wrote *The Spirit of Romance* (1910) and he translated Guido Cavalcanti's *Sonnets and Ballate* (1912–13) and the *Canzoni of Arnaut Daniel* (1914). But he became best known for several volumes of poetry in a cubist or imagist—or, as the author prefers to call it, vorticist—style; *Personæ* (1909), *Exultations* (1909), *Provença* (1910), *Canzoni* (1911), *Ripostes* (1913), *Cathay* (1915).

POUND, Roscoe (1870–). An American law scholar and publicist; also a botanist. He was born at Lincoln, Neb., and was educated at the University of Nebraska (A.B., 1888; A.M., 1889; Ph.D., 1897) and at Harvard Law School. Admitted to the bar in 1890, he practiced in Lincoln. He was assistant professor of law at the University of Nebraska from 1898 to 1903 and professor and dean (1903–07), professor at Northwestern University (1907–09), at Chicago (1909–10), and then Story professor at Harvard till 1913, when he was appointed Carter professor. As lawyer, teacher, and publicist he became widely known for his scholarship and fresh interpretations of old statutes. From 1904 until 1907 Pound was a member of a commission to make uniform the laws of Nebraska, and in published articles he advocated general uniformity of law. In 1913, with Charles W. Eliot and L. D. Brandeis, he served on a committee which investigated the administration of justice in the United States, with a view to improved efficiency. In 1911 he held the presidency of the Association of American Law Schools. His writings include: *Phytogeography of Nebraska* (1898–1900); *Readings on the History and System of the Common Law* (2d ed., 1913); *Justiee according to Law* (1914).

POUNDAGE. See Tonnage and Poundage.

POURBUS, p͞oor′bụ′. A family of Flemish painters.—Pieter (c.1510–84) was born at Gouda, settled at Bruges, and became a member of the Guild of St. Luke in 1543. He made some interesting maps and plans of Bruges, and painted single portraits, such as those of Jean Fernagant and his wife (1551, Bruges Museum), which are excellent in characterization and color. His portrait groups and religious compositions, however, are tiresome. In the academy and churches of Bruges there are a number of good works by him.—Frans the Elder (c.1545–c.1581) was born in Bruges. He was the son and pupil of Pieter, and also studied under Frans Floris. He lived principally in Antwerp, where he became a member of the Guild in 1569. His portraits, which include those of Queen Elizabeth (Rijks-Museum, Amsterdam), and Alexander Farnese (Antwerp Museum), are notable for their fine, mellow color. There are also religious pictures by him in Ghent Cathedral, including his masterpiece, "Christ among the Doctors"; in the Ghent Museum, the Antwerp Academy, and elsewhere. Though different in style his works are frequently confounded with those of his son and pupil, Frans the Younger (c.1569–1622), born in Antwerp. He became court painter to the Duke of Mantua about 1600, and afterward worked at the court of France, and died in Paris. In the Louvre, Paris, are portraits by him of Henry IV of France (a small version in the collection of the New York Historical Society) and of Maria de' Medici and portraits of the latter also in the Rijks-Museum, Amsterdam, and the Madrid Gallery. His "Henry IV Lying in State" is in the Berlin Gallery, and his two finest religious canvases, "The Last Supper" and "St. Francis of Assisi," are in the collection of the Louvre. By some critics Frans the Younger is considered a better colorist than his father.

POURCEAUGNAC, p͞oor′sȯ′nyȧk′, Monsieur de. A prose comedy by Molière (1669).

POUR LE MÉRITE, p͞oor le mā′rĕt′ (Fr., for merit). A Prussian order conferred for military and civil distinction. It originated in the Order of Generosity, founded in 1667, and in 1740 was reorganized by Frederick II into an order of merit. In 1810 it was expressly made a reward for distinction in battle. The decoration is a blue cross of eight points, the arms separated by golden eagles and bearing the inscription, "Pour le mérite." A civil class was established in 1842 by Frederick William IV. Its decoration is a blue band with the name of the order, inclosing a central gold medallion with the Prussian eagle. See Plate of Orders.

POURPOINT, p͞oor′point, *Fr. pron.* p͞oor′pwăɴ′ (OF., Fr., *pourpoint*, from ML. *perpunctum*, quilted garment, from Lat. *perpungere*, to pierce through, from *per*, through + *pungere*, to pierce). A doublet made of quilted cloth, worn for defense by both soldiers and civilians in the fourteenth, fifteenth, and sixteenth centuries. See Gambeson.

POURTALES, p͞oor′tȧ′lĕs′, Louis François de (1824–80). An American naturalist, born at Neuchâtel, Switzerland. He was a pupil of Agassiz, whom he accompanied in 1840 on glacial expeditions in the Alps and in 1847 to the United States, where in 1848 he entered the government Coast Survey. In 1851 he assisted in the triangulation of the Florida reef, and from 1854 until his resignation in 1873 had special charge of the office and field work of the tidal department of the Coast Survey. In 1873 he became custodian of the Harvard Museum of Comparative Zoölogy, in which he had previously been assistant in zoölogy. He was the first in the United States to undertake deep-sea dredging, and was an authority on marine zoölogy. The name Pourtalesia was given to a variety of sea urchin. Pourtales presented his extensive collections to the Harvard Museum. He was a member of the National Academy of Sciences and wrote various contributions to the Coast Survey reports, to Silliman's *Journal*, and to the *Proceedings* of the American Association for the Advancement of Science. He published, under the auspices of the museum, several works, including: *Contributions to the Fauna of the Gulf Stream at Great Depths* (1867–68); *Deep-Sea Corals* (1871); *Corals and Crinoids* (1878); *Report on the Corals and Antipatharia* (1880).

POUSSIN, p͞oo′săɴ′, Gaspar (1613–75). An Italian landscape painter, the son of a Frenchman settled in Rome. He was the pupil of his brother-in-law, Nicolas Poussin, whose name he adopted in place of his own, which was Dughet. He was called by the Italians Gasparo Duche, and he inscribed his etchings (eight in number) in that way. He never left Italy, and lived chiefly in Rome, where he died May 27, 1675. His landscapes are composed in general from studies in the Campagna of Rome and the surrounding country. His treatment of form and line is peculiarly effective, and he excelled in the portrayal of the wind and the storm, the sombre effects of his paintings being increased by the influence of time in darkening the colors. He was a very facile painter. Many European galleries possess examples of his works, which are especially numerous at Rome, Vienna, and London. His most ambitious labors were undertaken in Rome—the series of frescoes of the life of Elias, in the church of San Martino; the cycle of 12 tempera landscapes in the Colonna Palace; and another of 25 large landscapes in oil in the Doria Pamfili Palace. A typical landscape by him is in the Metropolitan Museum, New York.

POUSSIN, Nicolas (1593 or 1594–1665). A French painter, the originator of the classic and academic element in French painting. He was born at Villers, near Grand Andely (Normandy), the son of a gentleman of Picardy who had fought under Henry IV. Placed with a Latin master, he preferred design, and having studied, against the wishes of his parents, at Les Andelys under Quentin Varin, he went to Paris. There, under great privations, he worked with Ferdinand Elle and Georges Lallemand. His association with the mathematician Courtois, whose collection of engravings he studied, filled his mind with the fixed determination to reach Rome. After two vain attempts he succeeded, through the aid of an Italian friend, Marini, arriving in Rome in the spring of 1624. Together with the Flemish sculptor Duquesnoy, who had been his friend in Paris, and with Algardi, afterward one of the greatest baroque sculptors, Poussin studied antique statues. He also dissected with the surgeon Larchi, sketched after Raphael and Giulio Romano, and made a thorough study of landscape in wanderings about the Campagna. A great admirer of Domenichino, he was admitted to that master's studio and was much influenced by him in composition.

He was at first unsuccessful in Rome, and during a serious illness was taken care of by a countryman, Dughet, whose daughter he married. But through the pictures executed under the patronage of Cardinal Barberini he became famous, winning in especial the favor of Richelieu, who was the means, after two years of persuasion, of inducing him in 1640 to return to Paris. He was received with high honor, made first painter to the King, and allotted an income of 3000 livres a year. Besides a number of other paintings he produced eight cartoons for the Gobelins and the designs for a scheme of decoration, representing the "Labors of Hercules," for the Louvre. But, ever homesick for Rome, and disgusted with the intrigues of Vouet and others, he returned in September, 1642, passed the remainder of his life there in quiet, unremitting activity, and died there Nov. 19, 1665.

Although Poussin learned his art and passed the best part of his life in Italy, he may properly be classed with the French school, into which he introduced the classical element, which even now forms one of its chief characteristics. He exercised the greatest influence upon the French painters who studied at Rome—Claude Lorrain, Lebrun, Mignard, Bourdon, etc. His art may be divided into two periods, the dividing point of which is his sojourn in France in 1640–42. His early manner is more brilliant and facile and better in color; afterward his art is more dominated by classic ideals and rigid in execution. His composition is symmetrical, though not always free; his drawing correct; his color, which has suffered much from the dissipation of surface pigments, now seems hard. In his figure compositions he rendered the feeling of the antique as had no man before him; besides which he was, more than any one else, the creator of the classic or heroic landscape, later developed by Claude Lorrain.

Nearly all the galleries of Europe possess examples of Poussin's works. The Louvre is richest, with 39, among the best known of which are the "Triumph of Flora" (1630); "Philistines Stricken by the Pestilence"; "Eleazar and Rebecca"; two "Bacchanals"; the "Last Supper"; "Orpheus and Eurydice"; "The Shepherds of Arcady," celebrated for its curious inscription *Et in Arcadia ego;* and his own portrait. In the Vatican is his "Martyrdom of St. Erasmus"; in the Barberini Palace (Rome) the "Death of Germanicus." Other examples are in the galleries of Berlin, Dresden, Vienna, Madrid (21), Dulwich, and the National Gallery, London. The well-known series of the "Seven Sacraments" is in the Belvoir Castle. His works were engraved by the most celebrated engravers of the day, including Audran, Pesne, and Stella. Consult: Poussin's *Letters* (Paris, 1824); his *Œuvres complètes* (ib., 1845); and his *Life* by Gault de St. Germain (ib., 1806) and E. H. Denis (London, 1899); also Victor Advielle, *Recherches sur Nicolas Poussin* (Paris, 1902).

POUT, or Horned Pout. See Bullhead.

POUTER PIGEON. A breed of domestic pigeons capable of puffing out the throat and chest enormously by inflating the crop, which it does frequently. See Pigeon, and Colored Plate of Pigeons.

POUTRINCOURT, po͞o'trăɴ'ko͞or', Jean de Biencourt (1557–1615). A French colonizer. He went to Canada in 1603, under the leadership of De Monts, and in 1604 received a grant of Port Royal. He busied himself principally, however, in trading with the Indians, and his colony suffered in consequence. In 1606 he fortified Port Royal and joined Champlain on an exploring expedition as far as Point Fortune, now the town of Chatham, in the Province of Ontario. His opposition to the Jesuits prevented him from carrying out the French King's wishes in regard to missionary work among the Indians. He returned to France in 1612, sailed again for Acadia after its desertion by the English in 1614, but did nothing for his Port Royal colony and finally returned to France the same year.

POUVILLON, po͞o'vē'yôɴ', Emile (1840–1906). A French novelist, born at Montauban. His writings, describing life in the South of France, are simple and charming in style. They brought him the Vitet prize. He wrote: *Nouvelles réalistes* (1878); *Césette*, crowned by the French Academy in 1881; *L'Innocent* (1884); *Le cheval bleu* (1888); *Chante-pleure* (1890); *Petites âmes* (1893); *Pays et paysages* (1895); *L'Image* (1897); *Le vœu d'une chaste* and *Jep* (1900); *Petites gens* (1905). In 1899, in collaboration with D'Artois, he published *Le roi de Rome* and *Les Antibel.*

PÓVOA DE VARZIM, pō'vô-ȧ dȧ vär-zēɴ'. A seaport of Portugal, in the Province of Entre-Minho-e-Douro, 18 miles north of Oporto (Map: Portugal, A 2). A bright, lively town and a favorite bathing resort for the people of north Portugal and Spain, its permanent population, consisting chiefly of fishermen, numbered, in 1900, 12,623; in 1911, 12,115.

POWDER. See EXPLOSIVES; GUNPOWDER; SMOKELESS POWDER.

POW'DERLY, TERENCE VINCENT (1849-). An American labor leader, born at Carbondale, Lackawanna Co., Pa. He received a common-school education, and after 1862 was in turn a switchman, car repairer, and machinist. He became president of the Machinists' and Blacksmiths' National Union, held several offices in the local and district assemblies of the Knights of Labor (q.v.), and in 1879 was elected General Master Workman of the latter organization. He reorganized the order and greatly furthered its interests, but in 1893 resigned owing to internal differences arising from opposition to his policy. In 1878, 1880, and 1882 he was elected mayor of Scranton as candidate of the Labor Greenback party. He was admitted to the bar of Lackawanna Co., Pa., in 1894, and to that of the United States Supreme Court in 1901. From 1897 until his resignation in 1902 he was United States Commissioner General of Immigration, and in 1907 he became chief of the Division of Information in the Bureau of Immigration, Washington. He assisted in establishing the *Labor Advocate* at Scranton in 1877, regularly contributed to the *Journal of United Labor,* and wrote on economic subjects for various periodicals of the United States and Canada. He was known also as a lecturer and published *Thirty Years of Labor: 1859-89* (1889); *The Labor Movement: The Problem of To-Day* (1890), with James and others; *Trusts* (1892), with Dodd.

POWDERY MILDEW. See GRAPE, *Diseases.*

POWELL, pou'el, BADEN (1796-1860). An English mathematician and divine, born at Stamford Hill. He was educated at Oriel College, Oxford, and graduated in 1817 with highest honors in mathematics. He was ordained in 1820 and appointed vicar at Plumstead in Kent, 1821, but devoted his leisure time to mathematics. In 1824 he was elected a fellow of the Royal Society, and in 1827 Savilian professor of geometry at Oxford, which chair he held till his death. He was involved in various theological controversies and wrote some works on religious subjects. He was the father of Sir George and Sir Robert Baden-Powell. Among his works may be mentioned: *A Short Elementary Treatise on Experimental and Mathematical Optics* (1833); *Revelation and Science* (1833); *A Historical View of the Progress of the Physical and Mathematical Sciences* (1834); *The Connection of Natural and Divine Truth* (1838); *A General and Elementary View of the Undulatory Theory as Applied to the Dispersion of Light* (1841); *Essays on the Spirit of the Inductive Philosophy* (1855); *Christianity without Judaism* (1857); *The Order of Nature Considered with Reference to the Claims of Revelation* (1859); *On the Study and Evidences of Christianity* (1860).

POWELL, FREDERICK YORK (1850-1904). An English historian, Icelandic scholar, and Socialist. He studied at Rugby and at Christ Church, Oxford, where he was law lecturer, tutor, and senior student, later becoming fellow of Oriel College. But he is better known as an author and a contributor to the *Encyclopædia Britannica* and the *English Historical Review.* With Vigfusson he edited and translated the *Corpus Poeticum Boreale* (2 vols., 1881) and an *Icelandic Reader* (1879). Alone Powell wrote: *Early England up to the Norman Conquest* (1876); a history of *England to Death of Henry VII* (1885); *Old Stories from British History* (1894); and, with Vigfusson, *Origines Islandicæ* (posthumous, 1905). Consult *Life and Letters* edited by O. Elton (2 vols., 1906).

POWELL, JOHN WESLEY (1834-1902). An American soldier, explorer, geologist, and anthropologist, born March 24, 1834, at Mount Morris, N. Y. His parents had come to the United States from England a short time before his birth, and his early childhood was passed in Ohio, Wisconsin, and Illinois. He studied in the preparatory departments of the Wesleyan College at Wheaton, Ill., and of Illinois College, and during 1857-58 at Oberlin College, where he discovered his bent towards natural science. When the Civil War broke out he at once enlisted as a private in the Union army; after short service he rose to the rank of major, and was subsequently offered the commission of colonel, but declined. While serving as major at the battle of Shiloh he lost his right arm. At the close of the war he accepted an appointment as professor of geology in Illinois Wesleyan University, at Bloomington, in 1867 resigning this to take a similar position in Illinois Normal University. In the summer of the latter year Major Powell visited the Rocky Mountains of Colorado for exploration and research. The following year he organized a party of mountaineers and explored a portion of the Colorado River region, finally going into winter quarters on the White River. On May 24, 1869, the party of 10 set out on a voyage through the cañon which lasted more than three months and was fraught with great dangers and hardships. The result of this daring expedition brought Major Powell into prominence before the scientific world, and from that time until his death he was an active and conspicuous personage among American scientists. In 1869 he induced Congress to establish a geological and topographical survey of the Colorado River and its tributaries, an undertaking which consumed the following 10 years. Meanwhile, to enable Powell to make further explorations, Congress voted $10,000, and during 1871-73 he made his second expedition down the Colorado River. The establishment between 1865 and 1875 of many surveys of the Western country, which acted independently and often in competition with one another, led Powell to attempt a satisfactory adjustment of these surveys under some combined system of operation. As a result of this, Congress, in March, 1879, discontinued the separate surveys and established the United States Geological and Geographical Survey, which had Clarence King as its first director. During Powell's Western work he gathered for the Smithsonian Institution much valuable ethnological and anthropological material regarding the American Indians, and in 1876 this was published as *Contributions to North American Ethnology.* On the retirement of King from the directorship of the Geological Survey in 1881, Powell was appointed his successor. In 1894 he resigned this office to devote himself to the directorship of the Bureau of Ethnology, and to psychological and philosophical studies, in which field he published *Truth and Error* (1899). He died at Haven, Me., Sept. 23, 1902.

Major Powell was a member of most of the important scientific societies of the United States, and served as president of the Anthropological Society of Washington and (1888) of the American Association for the Advancement of Science. He was the recipient of many honors from foreign societies, among which was the Cuvier prize, awarded to him and his associates on the Survey in 1891. In 1915 a monument to him (a great seat with a bronze tablet) was about to be erected by the government on Hope Point, Colorado River. His important contributions to scientific literature include the following: *Exploration of the Colorado River of the West and its Tributaries* (1875); *Report on the Geology of the Uinta Mountains* (1876); *Report on the Arid Region of the United States* (1879); *Introduction to the Study of Indian Languages* (1880); *Studies in Sociology* (1887); *Canyons of the Colorado* (1893); *Physiographic Processes, Physiographic Features, and Physiographic Regions of the United States* (1895). Consult: G. K. Gilbert (ed.), *John Wesley Powell: A Memorial* (Chicago, 1903); F. S. Dellenbaugh, *A Canyon Voyage: The Narrative of the Second Powell Expedition* (New York, 1908); id., *The Romance of the Colorado River* (3d ed., ib., 1909); W. M. Davis, in the *National Academy of Sciences, Biographical Memoirs* (Washington, 1915).

POWELL, Lyman Pierson (1866-). An American Protestant Episcopal clergyman and college president, born at Farmington, Del. He graduated from Johns Hopkins in 1890, studied at the universities of Wisconsin (1892-93) and Pennsylvania (1893-95), and in 1897 completed the course of the Philadelphia Divinity School. Ordained a priest in 1898, he had several charges (at Ambler and Lansdowne, Pa., and at Northampton, Mass.) until 1912. After a year as professor of business ethics at New York University, he became president of Hobart College and of William Smith College (Geneva, N. Y.) in 1913. Dr. Powell is author of *The History of Education in Delaware* (1893); *Family Prayers* (1905); *Christian Science: The Faith and its Founder* (1907); *The Art of Natural Sleep* (1908); *The Emmanuel Movement in a New England Town* (1909); *Heavenly Heretics* (1909). He edited: *American Historic Towns* (4 vols., 1898-1902); *Current Religious Literature* (1902); *Devotional Series* (3 vols., 1905-07); *Religion in our Colleges and Universities* (1912).

POWELL, Maud (1868-). An American violinist, born in Peru, Ill. Her first teacher was W. Lewis, of Chicago. In 1880 she entered the Leipzig Conservatory as a pupil of Schradieck. After a year with Dancla in Paris she went to Berlin to Joachim in 1884, and made her début, in 1885, with pronounced success, at a concert of the Berlin Philharmonic Society. On her return to her native land she met with instant recognition, and thereafter was held in the highest esteem. She made extensive tours of Europe, South Africa, and the United States. She was tireless in bringing out new works for the violin; indeed no other American musical artist ever introduced so many programme novelties. The American composer found in Maud Powell a most energetic and intelligent champion. In 1904 she was married to H. G. Turner.

POWELL, Sir Robert Stephenson Smyth Baden-. See Baden-Powell, Sir R. S. S.

POWER (OF. *povoir, poueir, poer,* Fr. *pouvoir,* It. *potere,* power, from ML. *potere,* for Lat. *posse,* to be able). In the English and American law of real property, an authority vested in one or more persons enabling them to make valid conveyances of land irrespective of their having any interest therein themselves. Such a power may be created by any instrument capable of transferring real estate, but it is most frequently conferred by will. It may be general, authorizing the person in whom the power is vested (known as the donee of the power) to convey to any person whatsoever, including himself; or special, where the exercise of the power is restricted to certain persons or classes of persons. The latter is its more usual form.

The will of the person creating the power (known as the donor) must be strictly observed, not only as to the persons in whose favor it may be exercised, but also as to the time and mode of its execution, whether during the lifetime of the donee, by deed, or at his death, by last will and testament. The power when duly executed is operative to divest the estate of the person by whom the land is then held and to vest it in one or more others according to its terms. But the deed or will by which this result is produced is regarded not as that of the donee executing the power, but as that of the donor by whom it was created, and it derives its efficacy from the instrument by which the power was created. Its operation, therefore, is to invalidate (or, more properly, to revoke) the previous existing title and to substitute the title of the new appointee in its stead. Accordingly, where, as in the ordinary case, the real property is vested in one person and the power of appointment, as it is more fully described, in another, the legal title of the former is held in strict subordination to the power held by the latter, and the due execution of the power will invalidate any conveyance or incumbrance of the property by such owner.

Powers are described as owing their efficacy to the Statute of Uses, which had the effect of transforming into legal estates the equitable interests in land, which, under the former practice of conveying property to one person to the use of another, might have been created by parol appointment. Thus, the owner of land might give to another the use thereof, reserving to himself or giving to another the right or power of revoking such use or trust and appointing another in lieu thereof. It will be seen that it needed only the touch of the statute, converting these uses into legal estates, to put into effect the elaborate system of powers above described. This system forms an important and intricate chapter in the law of real property. It has, however, been greatly modified by statute in many of the United States. Consult E. B. Sugden, on *Powers* (8th ed., London, 1861), and H. T. Tiffany, *The Law of Real Property and Other Interests in Land* (2 vols., St. Paul, 1903).

POWER, in Mathematics. See Exponent.

POWER, in Physics. The work done by a machine or any agency in a unit of time. In the C. G. S. system the unit of power is one erg per second. Other units are, however, in practical use. Such are the watt, or 10^7 ergs per second, and the horse power, or 33,000 foot pounds per minute (this equals 746 watts approximately).

POWER, Transmission of. The processes and methods of transmitting the power generated by prime motors to the machines and mechanisms operated in performing useful functions are among the most important problems of modern engineering. In practically all cases the power generated by a prime motor (steam engine, water wheel, or windmill) has to be transmitted through an appreciable distance to be applied to the machine which utilizes it in performing work. The means by which this is accomplished are various and may be classed as gears or gearing, belts, chains and ropes, compressed air, hydraulic pressure, and electricity.

Gearing is one of the oldest and most extensively used methods of power transmission for short distances. If two cylinders with parallel axes are pressed together and one of them is rotated on its axis, it will drive the other by means of the friction between the surfaces. If actual teeth are formed upon the two cylinders, we have a pair of gear wheels which drive each other by pressure upon the faces of the teeth if the teeth are properly shaped. If the driving gear and the driven gear are of equal diameter, they have the same speed of rotation: if the driven wheel is smaller than the driving gear, it rotates faster, and if it is larger it rotates slower. Intermediate gear wheels are commonly introduced between the driving gear wheel and the driven gear wheel, which may be of the same or of different diameters. By the suitable arrangement of gear wheels and proper variations of their relative size and form, the motor-shaft speed may be either increased or diminished and the direction of rotation may be changed to any angle with the driving shaft. See illustration under Gear Wheel.

Belts. Next to gear wheels the most familiar means of power transmission are belts. (See Belt.) If two cylinders mounted on parallel shafts are set so far away from each other that their surfaces do not touch, one may be driven from the other by encircling both with an endless flat belt of flexible material. The driving power from the motor shaft is transmitted to the driven shaft by means of the friction or adhesion between the surface of the belt and that of the two pulleys. Change of speed is accomplished by increasing or decreasing the diameter of the driven pulley as compared with the driving pulley. Change in the direction of rotation is accomplished by crossing the belt; thus, a horizontal or an oblique pulley can be driven from a vertical pulley. Belt transmission is particularly an American development and is more extensively used in this country than elsewhere. In English practice for many years gearing was preferred to belts, and at present rope drives are used in England in preference to belts. Rope transmission is similar to belt transmission in principle and operation, but in place of flat belts embracing smooth-faced pulleys, one or more parallel endless ropes embracing groove-faced pulleys are used. Rope transmission, like belt transmission and transmission by gearing, involves the use of shafting as a part of the transmission system. See Shafting.

The dynamic or wire-rope transmission is a special development of rope transmission, the most familiar example of which, perhaps, is the cable railway. The dynamic transmission is best suited to distances up to about 1 mile.

Chain Drives consist of an endless chain of flat links which embraces toothed wheels, into the spaces between the teeth of which the alternate links of the chain fall and fit. The links are often made of special edge profile so as to engage the teeth with the least sliding action. This makes such drives more silent. The toothed wheel is often called a sprocket wheel. Chain drives are much used where the distance between the shafts is too short for satisfactory belt drive and where slipping under the belt would be objectionable, as in motor vehicles, pumping, and electric drives.

Water under high pressure (700 to 2000 pounds per square inch and upward) affords a very satisfactory method of transmitting power to a distance, especially for the movement of heavy loads at small velocities, as by cranes and elevators. The system usually consists of one or more pumps capable of developing the required pressure (see Pumps and Pumping Machinery); one or more accumulators by which a quantity of water may be accumulated at the required pressure (see Accumulators); the distributing pipes, and the presses, cranes, or other machinery operated. (See Hydraulic Press; Hydraulic-Pressure Engine.) Systems of hydraulic transmission for general industrial purposes exist in various European cities.

Air under pressure is extensively employed in transmissions for limited distances. (See Air Brake; Air Compressor; Compressed-Air Locomotive; Drill; Hammer; Pneumatic Dispatch; Pneumatic Tools.) Especially in mining compressed air is extensively used and may be transmitted over considerable distances. In Paris, France, air for power purposes is distributed through mains.

The most modern and most important means of power transmission is electricity, which is universally used for lighting, street-railway, and power service. The use of high-potential alternating currents has made the possibilities of this form of transmission far superior to any other for long distances. Such transmission as well as that over more limited distances will be found discussed under Transmission of Power, to which reference should be made.

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POW'ER, D'Arcy (1855–). An English surgeon, born in London. He was educated at New and Exeter colleges, Oxford, graduating from the latter in 1878. Four years later he took his degree of M.B. Settling in London, he became connected with several hospitals, at St. Bartholomew's serving as surgeon and lecturer. In 1883 he was admitted a fellow of the Royal College of Surgeons of England, in which he held the posts of examiner and Hunterian professor of surgery and pathology. His writings are on cancer, intestinal obstruction, and other medical subjects; *Memorials of the Craft of Surgery* (1886); a *Life of William Harvey* (1897); and biographies of eminent surgeons contributed to the *Dictionary of National Biography.*

POWER, Frederick Belding (1853–). An American chemist, born at Hudson, N. Y. He graduated from the Philadelphia College of Pharmacy in 1874 and from the University of Strassburg (Ph.D.) in 1880. After serving as professor of analytical chemistry at the former institution (1881–83) and as professor of pharmacy and materia medica at the University of Wisconsin (1883–92), he was director of the laboratories of Fritzsche Brothers in 1892–96 and thereafter till 1914 of the Wellcome Chemical Research Laboratories in London, England. Power received the Ebert prize of the American Pharmaceutical Association in 1877, 1902, and 1906, and was awarded gold medals at the St. Louis Exposition (1904), at Milan (1906), at the Franco-British Exhibition (1908), at Turin (1911), and the Hanbury gold medal (1913). At Liége (1905) he received a silver medal and at Brussels (1910) the grand prize. He made valuable original contributions to the chemistry of plant products, especially to our knowledge of both volatile and fatty oils. With Frederick Hoffmann he edited a *Manual of Chemical Analysis* (1883), and he translated several works. He became honorary member of various foreign societies.

POWER, (William Grattan) Tyrone (1797–1841). An Irish comedian, born near Kilmacthomas, County Waterford. He was taken to Wales while a child, and there about 1813 made his first appearance on the stage. He met with little success, however, and for some time filled only minor rôles. In London he made his first success in the part of Larry Hoolagan O'Halloran in 1824, and from that time confined himself almost exclusively to the portrayal of Irish characters. His acting was distinguished by its rollicking humor. He made four successful tours in the United States. Power was lost at sea. In addition to several plays he wrote three romances and *Impressions of America* (2 vols., 1836). His grandson of the same name (q.v.) was also an actor.

POWER, Tyrone (1869–). An American actor, grandson of the actor of the same name. He was born in London, England. His first appearance on the stage was at St. Augustine, Fla., in 1886 in *The Private Secretary.* He played in *The Lion and the Lamb* at New York in 1889, starred in his own play, *The Texan,* in London in 1894, subsequently toured with Beerbohm Tree, then joined Mrs. Fiske's company in America, toured Australia in 1900–02, appeared in the title rôle of *Ulysses* (1903) in New York, and toured with Julia Marlowe in *When Knighthood Was in Flower* (1904). Subsequently Power played in *Yvette* (1904); *Adrea* (1905); *The Redskin* (1906); *The Christian Pilgrim* (1907); *The Servant in the House* (1908); *Thaïs* (1911); *Julius Cæsar* (1912); and *Mark Antony.*

POWER FACTOR. See Electricity.

POWER OF APPOINTMENT. An authority or power vested in a person, whether himself the owner of the premises affected or not, to create a new interest or estate in property in favor of some one whom he may select. For example, A may convey land to B for life, with power to appoint some person to whom the property shall go on B's death. Inasmuch as the power to appoint always involves the power to divest or revoke an estate already vested in some one, it is sometimes referred to as a power of revocation and appointment. See Power, and consult Sugden, *Powers.*

POWER OF ATTORNEY. See Attorney.

POWER OF THE KEYS. See Keys, Power of the.

POW'ERS, Hiram (1805–73). An American sculptor. He was born July 29, 1805, on a small farm near Woodstock, Vt. As the farm proved insufficient for its support, his family moved to Ohio, where the boy first worked in a clock factory. Later he was employed for seven years to model and repair wax figures in a dime museum in Cincinnati. This occupation led to his moving to Washington, where he made wax portrait busts of leading men of the time, General Jackson, Daniel Webster, John C. Calhoun, Chief Justice Marshall, and others, which, being modeled from life, brought him into intimate relations with his famous subjects. In 1837 he carried the plaster casts of his busts to Italy, and to superintend their execution in marble he established a studio in Florence, where he spent the rest of his life. Within a year he had completed a statue, "Eve Tempted." His bust of Webster met with the approval of Thorvaldsen, and in 1843 he finished the well-known nude female statue, the "Greek Slave," of which many replicas were made, one being in the Corcoran Gallery, Washington. It had enormous success, especially in England, by reason of the beauty and chastity of its conception. A bust of "Proserpine," a statue of a "Fisher Boy" (Metropolitan Museum, New York), "America" (1854), "California" (1858, ib.), and "Eve Disconsolate" (Cincinnati Museum), are in the same style as the "Greek Slave." He made also statues of Franklin and Jefferson (1862, in the Capitol at Washington), of Washington for Louisiana, Webster for Boston, and Calhoun for South Carolina (1850). His best work, however, is in portrait busts of men. These include those of John Quincy Adams, Martin Van Buren (1835), Longfellow and General Sheridan (1865), and William J. Stone (Corcoran Gallery). Powers was a realist of strong convictions, but was lacking in skill and originality. Consult H. T. Tuckerman, *Book of the Artists* (New York, 1867), and Lorado Taft, *American Sculpture* (ib., 1903).

POWERS, James T. (1862–). An American actor and vocalist. He was born in New York City, first appeared as Chip in *Dreams of Fun in a Photograph Gallery* (1880) in Boston, later played comedy rôles at Drury Lane and the Empire in London, and appeared as Rats in *A Tin Soldier* in New York. Powers played comedy parts in *Erminie, Nadjy,* and other operas, after 1891 starred in various farce comedies and operas, and later appeared in *The Blue Moon* (1906); *Havana* (1909); *Two Little Brides* (1912). In 1913 he reappeared as Wun-Hi in *The Geisha,* one of his old successes.

POWHATAN, pou'â-tăn' (c.1550–1618). A famous Indian sachem. His real name was Wahunsonacook, Powhatan being the name of his tribe. He was originally a chief, or *werowanee,* of 8 tribes, but gradually gained control over at least 34 tribes in the surrounding country and, for an Indian, lived with the greatest pomp and ceremony. He lived part of the time at a village, Powhata, near the site of the present Richmond, and part of the time at another village, Werowocomoco, in the present Gloucester County, Virginia, about 15 miles from Jamestown. Powhatan's dominions extended from the Roanoke River, in North Carolina, to the head of Chesapeake Bay, and in all this country his will was despotic. In 1607 he held Captain John Smith as a prisoner for a time, and was said to have condemned him to death and to have spared him on the intercession of Pocahontas (q.v.), his daughter. In 1609 Smith and Capt. Christopher Newport visited him to secure provisions, and formally crowned him, with much ceremony, as the Emperor of the Indies. Since Captain Smith had attempted to capture Powhatan, he planned, in retaliation, the destruction of the English, who were saved by the timely warning of Pocahontas. For the most part he was very suspicious of the colonists, but during his later years lived on terms of peace with them. Powhatan died in April, 1618, and was succeeded by his brother Opechancano.

POWHATAN CONFEDERACY. A confederacy of Algonquian tribes of eastern Virginia, deriving its name from its organizer and ruling chief, Powhatan (q.v.). The territory of the confederacy comprised all of tidewater Virginia from Chesapeake Bay inland to the falls of the principal rivers, or just west of a line drawn through Fredericksburg, Richmond, and Petersburg, and may possibly have included also the Virginia counties on the eastern shore, although this may be considered doubtful. The tribes included within the confederacy numbered about 30, of which the Pamunkey, Chickahominy, Nansemond, Nantaughtacund, Potomac, and Wicocomoco were the largest. Their total population was estimated by Smith in 1607 at 2400 warriors, possibly 8000 souls, occupying about 200 villages and small settlements along the streams. The confederacy as it then existed was of recent extension, all, excepting those tribes adjoining the site of Richmond and upon the Pamunkey and its branches, having been conquered and annexed by Powhatan during his lifetime. It was not until the settlement of Jamestown in 1607 that continuous intercourse between the whites and the Powhatan tribes began. The first contact was generally friendly, but a hostile feeling soon sprang up between the two races, which was fast leading to open warfare when, on account of the marriage of Pocahontas to John Rolfe, Powhatan was induced to make a treaty of peace and friendship with the English. This peace lasted until after his death in 1618, when his successor, Opechancano, organized a conspiracy to drive the whites from the country. On March 22, 1622, the war began with a general massacre, in which 347 persons perished and the majority of the scattered settlements were destroyed.

A war of 14 years' duration ensued, until both sides were exhausted, when peace was made in 1636. The greatest event of this war was the battle of Pamunkey in 1625, when Governor Wyatt engaged and defeated nearly 1000 Indian warriors and destroyed the principal town of the confederacy. In 1644 Opechancano organized a second conspiracy, which began with a general attack upon the settlements, resulting in the death of about 300 settlers, but the Indians were already decimated and impoverished and unable to follow up their temporary advantage. Within a year the war was ended by the capture and death of the old chief; each remaining tribe made what terms it could for itself, and the confederacy came to an end. In 1669 a census showed that the 2400 warriors of 60 years ago had been reduced to 528, a diminution from perhaps 8000 to about 1600 souls, or hardly one-fifth the original number. In the war of Bacon's rebellion, 1675–76, they were again hunted down like wild animals until the fugitives took refuge in a palisaded fort near the site of Richmond. The fort was stormed and men, women, and children were massacred by the whites. Those who escaped were allowed to live on condition of an annual tribute from each village. In 1684 four chiefs attended as delegates at the making of a treaty at Albany by which the Iroquois agreed to cease their attacks upon the Virginia remnants. This is their last prominent appearance in history. In 1705 they had four towns, the largest being Pamunkey, with about 200 souls. There were in 1915 about 200 representatives of the old stock.

All the typical Indian customs of scalping, tattooing, dancing, and medicine men were found among the Powhatan tribes when first known to the whites. They wore very little clothing beyond the G string for men and a short skirt for women, with a robe for state occasions or in very cold weather. The men commonly shaved the hair on one side and left it flowing loosely on the other. Their houses were wigwams of wagon-top shape, with framework of poles covered by bark or mats, sometimes built closely together and surrounded by stout palisades. They cultivated corn, beans, squashes, and tobacco, which, with fish, game, and wild fruits, gave them an abundant subsistence. They were expert at shaping dugout canoes and weaving fish nets and baskets. The dead were buried in the ground or preserved in a mummified condition in houses built for the purpose. They had an elaborate mythology and ceremonial, of which very little is now known, with sacred temples guarded by priests. Tribal government was based on the clan system, with descent in the female line. Their history proves that they were brave and expert warriors. Their modern mixed-blood representatives are either fishermen or farmers. See OPECHANCANO; POCAHONTAS; POWHATAN; VIRGINIA.

POWN'ALL, THOMAS (1722–1805). An English statesman and Colonial official. He was born at Saltfleetby, Lincolnshire, graduated at Trinity College, Cambridge, in 1743, and soon afterward obtained a place in the office of the Board of Trade and Plantations. In 1753 he removed to New York as private secretary to Governor Osborn. The next year he was present at the Albany Congress and while there became convinced of the desirability of intercolonial union. About this time he made the acquaintance of Benjamin Franklin, and the friendship then formed lasted until Franklin's death. In 1757 Pownall became Governor of Massachusetts and shortly afterward of New Jersey also, but soon resigned the latter office. He was very active in raising troops to fight against the French. Having grown tired of his office and applied for his recall, he was in 1759 appointed Governor of South Carolina, but he returned to England without visiting that Colony. In England he proved himself a stanch friend of the colonists. He contended that they were entitled to the same rights as Englishmen and proposed a scheme for what would now be called Imperial federation. From 1768 to 1780 he was a member of Parliament and as such denounced the oppressive acts directed at the Americans; but when war broke out he gave some support to Lord North and opposed Burke's conciliatory bill of November, 1775. Soon afterward, however, he declared that the Colonies were lost forever, urged that to circumvent the French a commercial treaty should be negotiated with the colonists, and in 1780 brought in a bill for making peace. By most of his contemporaries Pownall was regarded as a visionary on political matters, but he really possessed profound insight, and he foresaw, among other things, the future preponderance of the English race in America. As a scientist, antiquary, and man of letters he was better appreciated and was a member of the Society of Antiquaries and of the Royal Society. He wrote on a great variety of subjects. His works include: *Administration of the Colonies* (1764); *Topographical Description of the Middle Colonies* (1776); *Memorial to the Sovereigns of America* (1783); *Hydraulic and Nautical Observations on the Currents of the Atlantic Ocean* (1787), with notes by Dr. Franklin; *Memorial to the Sovereigns of Europe and the Atlantic* (1803). Consult C. A. W. Pownall, *Thomas Pownall* (London, 1908).

POX, The. See Syphilis.

POYN′INGS, Sir Edward (1459–1521). An English statesman. In 1483 he took a prominent part in the Kentish uprising in behalf of Buckingham in the insurrection of the latter against Richard III. His name having appeared in Richard's proclamation, he fled to the Continent, identified himself with the fortunes of Henry, Earl of Richmond (later Henry VII), and landed in England with the Earl in 1485. In that year he became Privy Councilor, and in 1492 was sent with a force of 1500 men to reenforce Maximilian I in the contest with his rebellious subjects in the Netherlands. He effectually did away with rebel privateering and with the Duke of Saxony captured Sluis. In 1494 he was sent with an army to Ireland as Lord Deputy, with the purpose of completely subjugating the country, and in the same year convoked a Parliament which, under his direction, passed various acts that crushed the Yorkist party in Ireland and placed the administration of Irish affairs under the direct control of the English crown and Privy Council. (See Ireland.) He made two expeditions to Ulster, drove the Pretender, Perkin Warbeck, to Scotland, and was recalled in 1496.

POYNINGS LAW. A statute enacted by the Irish Parliament at Drogheda in 1494. See Ireland, *History;* Poynings.

POYNTER, Sir Edward John (1836–). An English historical and decorative painter and author. He was born in Paris, the son of Ambrose Poynter, an architect. He studied in London at Leigh's Art School and at the Royal Academy and under Gleyre in Paris. Returning to London, he served as Slade professor of fine arts at University College from 1871 to 1875, when he became director of the art schools at South Kensington Museum. From 1894 to 1905 he was director of the National Gallery. Elected Royal Academician in 1876, in 1896 he succeeded Millais as president of the Academy. He was made Baronet in 1902. His art, based upon classic models, is decorative and scholarly. A careful technician, he evinces talent for design and a sense of style. His work includes designs for frescoes, mosaics, stained glass, and tile work, notably in London in St. Paul's Cathedral, Westminster Palace, and South Kensington Museum, and in St. Stephens, Dulwich. For the English coinage of 1894 he made two sets of designs. His water-color landscapes and portraits are strong and simple. Among the classic oil paintings by which he is best known are: "Israel in Egypt" (1867); "Perseus and Andromeda" (1872); "Atalanta's Race" (1876); "The Ides of March" (1883, Manchester Gallery); "Idle Fears" (1894); the "Ionian Dance" (1899); "Lesbia and her Sparrow" (1907); "A Naval Disaster" (1912); and "A Visit to Æsculapius" (Tate Gallery), which is considered in point of technique one of the best products of English classicism. Poynter published *Ten Lectures on Art* (1879) and edited the *Illustrated Catalogue of the National Gallery* (1889–1900). Consult Cosmo Monkhouse, in the *Art Annual* (London, 1897).

POYN′TING, John Henry (1852–1914). An English scientist, born at Monton, Lancashire. He was educated at Owens College, Manchester, and at Trinity College, Cambridge, of which he became fellow in 1878, and in 1880 was appointed professor of physics at Mason College, Birmingham (now the University of Birmingham). He served as president of the Physical Society in 1905. His writings include contributions to the *Philosophical Transactions* and to the *Proceedings* of the Royal Society on the transfer of energy in the electromagnetic field, the mean density of the earth, the connection between the electric current and the electric and magnetic induction in the surrounding field, and other topics. His Adams prize essay (Cambridge, 1893), *On the Mean Density of the Earth,* was published in 1894. Poynting collaborated with Sir J. J. Thomson (q.v.) on a *Text-Book of Physics,* issued in parts between 1899 and 1914, the subjects treated being: *Sound, Properties of Matter, Heat, Electricity and Magnetism.* He published also *The Pressure of Light* (1910) and *The Earth: Its Shape, Size, Weight, and Spin* (1913).

POYNTZ, John. See Spencer, Earl.

POZARÉVATZ, pô′zhȧ-rĕ-vȧts, or **PASSAROWITZ**, pȧs-sä′rō-vĭts (Serv. *Pozarevac*). A town of Servia, situated about 35 miles southeast of Belgrade (Map: Balkan Peninsula, C 2). It has a considerable trade in agricultural products. It is noteworthy for the treaty concluded here on July 21, 1718, between Turkey on one side and Austria and Venice on the other. Turkey ceded the Banat, part of Servia (including Belgrade), and parts of Bosnia and Wallachia to Austria. She retained the Morea, which had been reconquered from the Venetians in 1715. Pop., 1900, 12,957; 1911, 13,411. Pozarévatz was captured by the Teutonic forces in 1915. See War in Europe.

POZHARSKI, pō-zhär′skē, Dmitri Mikhailovitch, Prince (1578–1642). A Russian patriot, liberator of Moscow from the Polish domination (1610–12). He fought against the Polish invaders, who had helped to place a pseudo-Demetrius upon the Russian throne, and for his successes was appointed voivode, or administrative official, of Zaraisk. In 1611 he marched upon Moscow against stubborn resistance, but was severely wounded and was compelled to retreat. Subsequently he assumed command of the volunteer forces assembled by Minin, a butcher of Nizhni Novgorod. With these he succeeded in expelling the Poles from Moscow, which they had held for two and a half years. He conducted further campaigns, was appointed boyar in 1613, and sent to Sweden on a diplomatic mission.

PÖZL, pĕts'l, Joseph von (1814–81). A Bavarian jurist, born at Pechtnersreuth. He studied at the University of Munich, and became professor of law at Würzburg in 1845. Two years afterward, on the appearance of his *Kompendium des bayrischen Staatsverfassungsrechts* (1847), which was in direct opposition to the practices of the ministry, he was called to the chair of constitutional law at Munich. A member of the Frankfort Parliament of 1848, in 1858 he entered the Bavarian Lower Chamber, of which he became first president in 1865. His works on Bavarian law are many and valuable; especially important are the *Lehrbuch des bayrischen Verfassungsrechts* (1851; 5th ed., 1877); *Sammlung der bayrischen Verfassungsgesetze* (1852; 2d ed., 1868–69); *Die Gesetzgebung des Königsreichs Bayern seit Maximilian II* (1852 et seq.), with Dollmann.

POZZI, pŏ'tsē', Samuel Jean (1846–). A French anthropologist and surgeon, born at Bergerac. He studied medicine under Broca in Paris, and in 1883 became head of the Hôpital de Lourcine (afterward called Broca). Devoting himself to gynæcology and the reform of its methods, Pozzi was commissioned by the Ministry of Education to study medical schools in Germany, England, Austria, Italy, and the United States. He founded the French surgical congress, was president of the Surgical Society of Paris, and in 1898 entirely remodeled the Hôpital Broca, making it one of the best-equipped hospitals in the world. Pozzi became professor of clinical gynæcology in the University of Paris. He wrote on anthropology and comparative anatomy, and was chosen president of the French Anthropological Society. On his medical specialty he published, among other valuable works, *Traité de gynécologie clinique et opératoire* (1890; 3d ed., 1897; trans. into German, English, Spanish, Italian, and Russian). From 1897 to 1902 Pozzi was Senator from Dordogne.

POZZO DI BORGO, pŏt'sō dē bôr'gō, Carlo Andrea, Count (1764–1842). A diplomat in the Russian service. He was born at Alata, Corsica, March 8, 1764, studied law at the University of Pisa, was an advocate in Corsica, and won high reputation for eloquence. Pozzo represented Corsica in the French National Assembly (1791–92) and was one of the Moderates. He returned to Corsica, where he attached himself to Paoli's party, and on the failure of that chief's plans retired to London. Here he became agent of the French émigrés, and in 1798 went to Vienna to promote an alliance of Austria and Russia against France, and accompanied the Russian army in the campaign of 1799. In 1804 he entered the Russian service as a Councilor of State. He was concerned in the Russo-Austrian alliance, which was dissolved by the battle of Austerlitz (1805); but after the Treaty of Tilsit he retired to Austria, from which Napoleon in 1809 demanded him. Pozzo fled to England (1810), stayed for some time, and then returned to Russia. He helped to bring about the rupture between Alexander I and Napoleon (1812). He also caused the defection of Murat and Bernadotte from Napoleon, and after the victorious allies had repulsed Bonaparte, Pozzo, at the Congress of Frankfort-on-the-Main, drew up the declaration "that the allies made war not on France, but on Napoleon." After Bonaparte's downfall he exerted himself with vigor at Paris (where he signed the Treaty of 1815 as Russian Ambassador) and at the Congress of Aix-la-Chapelle (1818) to ameliorate somewhat the hard conditions imposed upon France. He retired from public life in 1839, and settled in Paris, where he died, Feb. 15, 1842. His correspondence with Nesselrode (1814–18) appeared at Paris in 1890–97. Consult Vuhrer, *Notice biographique sur le comte Pozzo di Borgo* (Paris, 1842), and Maggiolo, *Pozzo di Borgo* (ib., 1890).

POZZUOLANA, pŏt'swō-lä'nȧ, **POZZUOLANO, POZZOLANA, PUZZUOLANA.** A volcanic rock, or powder, which has hydraulic properties when ground and mixed with lime. It is named from its occurrence at Pozzuoli (the ancient Puteoli), near Naples. It is earthy in character, consisting of particles in a very loose state of aggregation, but its chemical composition may agree very closely with that of basalt (q.v.). Trass is a volcanic ash of similar properties found in the Rhine district of Germany, and santorin earth is still another volcanic ash used as a cement, which is found on the island of Santorin in the Greek Archipelago. Trass is much used in Holland in fresh-water and marine engineering work. Artificial pozzuolanas may be made from slag, brick dust, or ashes. The use of pozzuolana as a hydraulic agent was known to the ancients, and is mentioned by both Seneca and Pliny. It was obtained from in and near Rome and from many other places besides Puteoli. It forms the basis of the Roman mortar, for which its hydraulic qualities rendered it invaluable. Consult A. H. Heath, *A Manual on Lime and Cement* (London, 1893), and C. E. Eckel, *Cements, Limes, and Plasters* (New York, 1907). See Cement; Concrete; Roman Art.

POZZUOLI, pŏt-swō'lē (Lat. *Puteoli*). A port in the Province of Naples, Italy, situated on the gulf of the same name, 6 miles west of Naples, with which it is connected by rail and by tramway (Map: Italy, F 1). It lies on a hill in a volcanic district, which is exceptionally rich in old Roman ruins of every description, including ancient piers and a few fragments of Cicero's famous villa. The Roman amphitheatre rises on three rows of arches, around which extends an exterior court. The arena is 369 feet long and 216 feet broad, and could be flooded with water for naval contests. Nero entertained guests here with gladiatorial combats, and here St. Januarius (q.v.) was in vain cast before wild beasts. The so-called Serapeum, in reality a market hall, was a square court with numerous small apartments surrounding it. It had 48 huge columns and its portico was graced by a frieze. In the court rose a round temple, with columns. The lower sections of the ruin are below sea level. The famous Solfatara in the immediate vicinity is the oblong crater of a semiextinct volcano. Sulphurous gases rise in it constantly, and the ground is hollow. Pozzuoli has mineral baths. An excellent cement is made from a peculiar earth found here. (See Pozzuolana.) Near Pozzuoli is an important branch of the manufacturing firm of Armstrong & Co. It manufactures cannon and armor plate for the Italian navy, and is fostered by the government. The harbor has of late been improved by the government. The population in 1912, according to Baedeker, was 17,000.

The foundation of Pozzuoli is ascribed to fugitives from Samos (q.v.) in 528 b.c., who called their new town Dicæarchia, which Greek name later gave place to the Latin name Puteoli. At first under the sway of Cumæ and later of Capua, it fell into the hands of the Romans, along with the latter city, in 338 B.C., and was fortified and held by them against Hannibal. After the conclusion of the Second Punic War the Romans planted a colony there, and the great prosperity of the city began and continued throughout the Empire. A mole was built, and Puteoli became the great emporium of trade with Alexandria and the Orient. It was also one of the most important cities of Italy for manufactures, and the beauty of its coast and the healing qualities of its sulphur springs enabled it to vie with its neighbors, Baiæ and Cumæ, as a fashionable watering place. Consult "Puteoli," in Friedrich Lübker, *Reallexikon des klassischen Altertums*, vol. ii (8th ed., Leipzig, 1914).

PRAAM. See Pram.

PRABODHA-CANDRODAYA, prȧ-bōd′hȧ-chȧn-drō′dȧ-yȧ (Skt., rise of the moon of intellect). A Sanskrit drama of the eleventh century by Krishna Misra, who wrote it for Kirtivarman the Chandella (1056–1116). The drama is in six acts and is an ardent defense of Vishnuitic Vedantism (see Vedanta) against infidelity, Jainism (q.v.), and Buddhism (q.v.). The *dramatis personæ* are 44 in number, all of them abstract in character. The action of the drama, while not rapid, does not drag, and the play closes with the overthrow of the hosts of Passion and the triumph of Reason, which, by union with Revelation, will produce True Knowledge and annihilate the reign of Error. The Prabodha-Candrodaya has been edited by Brockhaus (Leipzig, 1845) and again at Bombay (1898), and it has been translated into German by Goldstücker (Königsberg, 1842) and Hirzel (Zurich, 1846) and into English by Taylor (Bombay, 1811; reprinted, ib., 1893). Consult: Lévi, *Théâtre Indien* (Paris, 1890); Boissevain, *Het indische tooneelstuk Prabodhacandrodaya: I, toelichting en beoordeeling* (Amsterdam, 1905); A. A. Macdonell, *History of Sanskrit Literature* (London, 1913).

PRACTICE (from OF. *practiser, pratiser, practiquer, pratiquer*, Fr. *pratiquer*, to practice, from ML. *practicare, praticare*, to perform, from *practica*, business, fem. sing. of Lat. *practicus*, from Gk. πρακτικός, *praktikos*, practical, from πράσσειν, *prassein*, to do). In general, the acquisition of a special skill or dexterity by frequent performance of an action, or of a special experience by long familiarity with a subject. Psychologically regarded, it is a state of consciousness varying in degree with the amount of time and attention devoted to a problem and characterized in its higher stages by a maximal concentration of attention (together with all the advantages for observation that this insures) and by a maximal capacity for reproduction (extent and accuracy of memory). It is thus the converse of fatigue (q.v.). The determination of the stage of practice at which one is working is, therefore, of extreme importance in experimental psychology, especially in work of such fineness as, e.g., the comparison of short intervals of time. (See Duration.) Thorkelson, in an investigation of the time sense, distinguishes no less than six degrees of practice, the characteristic difference limens of which vary from one-tenth to one-twenty-fifth or less. See Discrimination, Sensible.

The distinction between general and special practice is important. General practice implies a familiarity with problems or actions of the same class or kind as those in hand; thus, any student who has worked in a psychological laboratory may be regarded as generally practiced in experimental psychology, whereas on entering the laboratory he was wholly unpracticed. So any one who has had piano lessons in childhood may be said to be generally practiced in musical appreciation and rendition. General practice furthers accuracy of observation and power of judgment at large. It does not imply, as special practice does, a peculiar facility for work of a special kind. General practice in piano playing does not assist one, in more than a general way, towards facility in rendering new compositions at sight; this facility must be gained by special practice with such compositions. Hence "general practice increases in direct proportion to special, but the reverse is not necessarily true."

The characteristics which we have assigned to the practiced consciousness—maximal degree and constant direction of attention, delicacy of perception, extent and accuracy of memory, confidence of judgment—are evidently of a functional nature; they tell us nothing of the contents or structure of consciousness. Practice introduces no new contents. It has, however, the effect of narrowing consciousness. The practiced observer is able, by the very fact of practice, to hold himself exclusively to the practiced subject matter and to ignore distracting influences. In this respect the practiced consciousness resembles the state of secondary passive attention (see Attention), and differs in structure considerably from the unpracticed, in which attention is discursive and contents are more numerous and disconnected.

For the relation of practice to fatigue and for change of performance under practice, see Fatigue; Learning.

Bibliography. E. L. Thorndike, *Psychology of Learning* (New York, 1913); E. B. Titchener, *Experimental Psychology*, i (ib., 1901); E. Kraepelin, *Die Arbeitskurve* (Leipzig, 1902); W. Wundt, *Physiologische Psychologie* (6th ed., ib., 1908–11); O. Külpe, *Outlines of Psychology* (New York, 1909); R. Schulze, *Experimental Psychology and Pedagogy* (ib., 1912).

PRACTICE. In its strict legal sense, the manner or order of conducting civil or criminal actions with reference to the successive steps necessary to be taken in order to bring the proper parties before the court and to bring the action or proceeding to a final determination. It is less comprehensive than the term "procedure," which includes the greater part of the adjective law, i.e., the law relating to remedies, as opposed to substantive law, which defines rights. Consult: Tidd, *Practice of the Court of King's Bench* (4th Amer. ed., Philadelphia, 1856); Beach, *Treatise on the Modern Practice in Equity* (Cincinnati, 1894); E. R. Daniell, *Pleading and Practice of the High Court of Chancery* (6th Amer. ed., 3 vols., Boston, 1894); F. A. Stringer, *A B C Guide to the Practice of the Supreme Court* (London, 1903). See Code; Pleading; Procedure.

PRADIER, prȧ′dyȧ′, James (1792–1862). A French sculptor. He was born in Geneva, of a family of French Protestant refugees, studied under Gérard and Lemot, and won the Grand Prix de Rome in 1813. He made his début in the Salon of 1819 with a statue of a

"Centaur and Bacchante," now in the museum at Rouen. Similar works are the "Toilette d'Atalante" (Louvre), the "Odalisque" (Museum of Lyons), "Poetry" (1846), the "Three Graces" (Château of Versailles), and "Sappho" and "Psyche" (both in the Louvre). His most important works, however, are the decorative figures of the Fontaine Molière, the figures in the spandrels of the Arc de Triomphe, the twelve Victories surrounding the tomb of Napoleon at the Invalides, and the statues of the cities of Lille and Strassburg in the Place de la Concorde, all in Paris. He made also the figures of the Fontaine Louvois; statues of Sts. Andrew and Augustine, in the church of St. Roch; the statue of St. Peter in St. Sulpice; a group of the "Marriage of the Virgin," in the Madeleine; and statues of Baron Gérard (Versailles), Jean Jacques Rousseau (Geneva), and Marshal Soult (Versailles).

Pradier's quiet, elegant, and graceful yet sensuous manner had many imitators, and created what may be called the style Louis-Philippe; but his influence disappeared under the romanticism of the following period. He was made a member of the Institut and professor at the Ecole des Beaux-Arts in 1827. For his biography, consult Etex (Paris, 1859).

PRADIER-FODÉRÉ, fō̇′dȧ′rȧ′, Paul Louis Ernest (1827–). A French law scholar, especially known for his writings on international law. He was born and educated at Strassburg and was admitted to the bar in Paris, where subsequently he occupied the chair of public law in the Armenian College. In 1874 he went to Lima on the invitation of the Peruvian government to reorganize the department of law. Returning after the war with Chile, he became judge in the Court of Appeals at Lyons (1882). Among his works are: *Précis de droit administratif* (1853; 7th ed., 1876); *Principes généraux de droit, de politique, et de législation* (1869); *La question de l'Alabama et le droit des gens* (1872); *Cours de droit diplomatique* (1881; 2d ed., 1900); *Traité de droit international public européen et américain* (1885–1906).

PRADILLA, prȧ-ᴅē′lyȧ, Francisco (1847–). A Spanish historical and genre painter, born at Villanueva de Gallego, Province of Saragossa. He studied art under distressing privations, first at Saragossa, then at the Madrid Academy until success in a competition enabled him to attend the Spanish Academy in Rome, of which afterward he was director (1881). The second of his more important works, "Joanna the Mad Following her Husband's Coffin" (1878, Madrid Museum), received the medal of honor at the Paris Exposition of 1878, and with "The Surrender of Granada, 1492" (1882, Senate Chamber, Madrid), he won a gold medal at Munich in 1883. But although well composed and drawn, his large historical pictures are lifeless and artistically less interesting than his well-colored genre scenes from popular life, such as: "Market Day Near Vigo" (1892); "Washerwomen at the Brook" (Breslau Museum); "The Road to the Sanctuary" (1895); "Festivity at the End of Harvest" (1902); and "Near the Rivulet" (1905). He painted also good decorations, notably in the Murga Palace, Madrid. He won gold medals also in Vienna and Berlin, and was appointed director of the Prado, Madrid, in 1897.

PRADO, prä′dō̇. The national museum of painting and sculpture in Spain, situated at Madrid. The palace containing the museum was begun in the eighteenth century as a museum of natural history, and was completed early in the nineteenth century. The collection of 2500 paintings is one of the finest in the world. It originated in the collection of the Emperor Charles V, whose acquisitions were added to by Philip IV and Philip V. In the early nineteenth century Ferdinand VII combined in the Prado all the royal collections except that of the Escorial, and to these, in 1840, a collection of Flemish and Spanish primitives was added on the dissolution of the religious houses of Spain. It is a connoisseur's collection rather than that of a student. The paintings have been neglected, and many have been damaged by restoration.

The collection is especially rich in works of the Spanish school, of the early as well as the late period. There are 46 examples of Velazquez, most of them masterpieces, including the celebrated equestrian portraits of Philip IV, Prince Balthezar, and Olivarez's "The Surrender of Breda," "Las Meninas," "The Tapestry Weavers." There are many El Grecos, several Murillos, and rooms filled with Goyas. The Italian school is represented by painters of the golden age exclusively. There are nine Raphaels, some of them executed by pupils, including the celebrated "Cardinal Alidisio," the small "Holy Family," and "The Madonna with the Fish." Titian is magnificently represented by 38 canvases, including the celebrated equestrian portrait of Charles V, the standing portraits of Charles V and Philip II, and "The Worship of Venus." There are fine examples also of Tintoretto, Veronese, and Tiepolo. The early Flemish school is well represented. There are 65 Rubenses, some of them masterpieces, and 21 Van Dycks. Among the few early German subjects are two fine Dürers, while French painting of the seventeenth century is better represented than anywhere except in the Louvre. The collection of sculptures includes some masterpieces of ancient Greek art. Consult: C. S. Ricketts, *The Prado and its Masterpieces* (New York, 1904); Calvert and Gallichan, *The Prado* (ib., 1907); C. S. Ricketts, *Art of the Prado* (Boston, 1907); A. F. Calvaert, *The Prado* (London, 1907); J. C. Van Dyke, *New Guides to Old Masters: Madrid* (New York, 1914); also the official catalogue, edited by Madrazo (Madrid, 1907).

PRADO, prä′dō̇, Mariano Ignacio (1826–1902). A Peruvian-Chilean soldier and politician, born at Huánaco. In 1854 he took a prominent part in the revolution that overthrew General Echenique, and again in 1865 was a leader in the movement against President Pezet, whose temporizing attitude towards Spain he strongly opposed. He forced Pezet to resign, and assumed control of the government. Having formed an offensive and defensive alliance with Chile, he declared war against Spain, and defended Callao against bombardment by the Spanish fleet (May 2, 1866). He then reformed the constitution, and was President in 1867, but the next year he was forced by a revolt to flee to Chile. Again President in 1875–79, he had a troublous administration. When outgeneraled in a war with Chile he resigned in favor of the Vice President and sailed for Europe. Prado was permitted in 1886 to return to Lima, where he took no further noteworthy part in politics. He died in Paris.

PRADON, prȧ′dôɴ′, Nicolas (1632–98). A French dramatic poet, born at Rouen. He came to Paris at an early age and devoted himself to play writing. His *Phèdre et Hippolyte* (1677) he was ordered to write by the Duchess de Bouillon and her brother, the Duke de Nevers, who were at the head of the plot against the *Phèdre* of Racine. A claque was hired to applaud the worse than mediocre play of Pradon at the cost of Racine's, and such was its success that it may well have been one reason why Racine wrote no more dramas for 12 years. Other works by Pradon are *Pyrame et Thisbé* (1674); *Tamerlan* (1675); *Regulus* (1688). Collections of his works were published in 1679, 1682, and 1700.

PRADT, prȧt, Dominique de (1759–1837). A French prelate and diplomat. He was born at Allanche (Auvergne), studied first in a military school, was ordained priest in 1783, and became doctor of theology at the Sorbonne in 1785. As vicar-general of the diocese of Rouen he represented it in the States-General of 1789, and, siding with the Clerical party, was forced to number himself among the *émigrés* (q.v.) in 1791. After the 18th Brumaire (Nov. 9, 1799) he returned to Paris and later became chaplain to Napoleon and Bishop of Poitiers. For his part in negotiating the Treaty of Bayonne, in 1808, by which Napoleon dethroned the house of Bourbon in Spain, he received as a reward the archbishopric of Mechlin. But his failure on a mission to Warsaw in 1812 resulted in his being retired to his diocese. Now openly embracing the cause of the Bourbons, Pradt was nominated by Louis XVIII Grand Chancellor of the Legion of Honor. Within a year, however, he was replaced by Marshal Macdonald. He was also relieved of his archbishopric of Mechlin, but received a pension of 12,000 francs from the King of the Netherlands. Retiring to his estate in Auvergne, he devoted himself to literary work. Pradt was elected Deputy from Clermont in 1827 and sided with the opposition, but after the revolution of July he renewed his Royalist allegiance. Among his numerous works are: *Histoire de l'ambassade dans le grand-duché de Varsovie en 1812* (1815; 9th ed., 1826); *Du congrès de Vienne* (1815); *Mémoires historiques sur la révolution d'Espagne* (1816); *Des colonies et de la révolution actuelle de l'Amérique* (1817); *L'Europe et les colonies depuis le congrès d'Aix-la-Chapelle* (1821). Consult De Lastic-Rochegonde, *Dominique de Pradt* (Saint-Armand, 1897).

PRADYUMNA. See Kama.

PRÆCOCES, prē′kō-sēz (Lat. nom. pl., premature, precocious). Those birds which, like the domestic fowl, run about and look after themselves, picking up their own food as soon as they are hatched; opposed to altrices. See Bird; Nidification.

PRAED, prād, Rosa Caroline Mackworth (Mrs. Campbell Praed). See Australian Literature.

PRAED, Winthrop Mackworth (1802–39). An English poet, born in London. He was educated at Eton and at Trinity College, Cambridge, of which he became a fellow in 1827, was called to the bar (1829), sat in Parliament (1830, 1834, 1837), became secretary to the board of control (1834) and afterward deputy high steward to the University of Cambridge. Praed was one of the prime movers in establishing a national system of education. His light essays and poems were contributed to various periodicals. As a writer of society verse Praed stands in the first rank. "Araminta," "The Vicar," and "My Little Cousins" well represent his range. Consult: *Poems*, edited, with memoir, by Derwent Coleridge (2 vols., London, 1864); selections from the poems, edited by Cooper in the "Canterbury Poets Series" (ib., 1886); *Political and Occasional Poems* (ib., 1888); and a collection of his essays published in Morley's *Universal Library* (ib., 1887).

PRÆ′MUNI′RE (Lat., to forewarn). In English law, an offense of the nature of a contempt against the sovereign and his government and punishable with forfeiture and imprisonment. The name is derived from the first words (*præmunire*, or *præmonere, facias*) of a writ originally introduced for the purpose of repressing papal encroachments on the power of the crown. The first statute of præmunire was passed in the reign of Edward I. The assertion by the Pope of the right to name the incumbents of vacant benefices in disparagement of the authority of the bishop, the crown, or other persons entitled by English law to fill the same was the immediate cause of various subsequent statutes of præmunire, which made it penal to endeavor to enforce the authority of papal bulls and provisions in England. By later statutes a number of offenses of a miscellaneous description have been rendered liable to the penalties of a præmunire.

PRÆNESTE, prē-nĕs′tē. The modern Palestrina. A very ancient city of Latium, situated on the slope of the hills about 20 miles southeast of Rome. Tradition ascribed its foundation to Telegonus, the son of Ulysses, or to a certain Cæculus, son of Vulcan. It was one of the important cities in the early Latin League, and is first mentioned by Livy (ii, 19, 2) as taking the side of Rome against the other cities of the league in 499 b.c. In 383 b.c. the town began to lord it over the allies of Rome, and two years later declared war on Rome. It was vanquished and forced to surrender to Cincinnatus (380 b.c.). In the Hannibalic war the Prænestines were faithful to Rome, and were rewarded with an offer of Roman citizenship, which, with lofty local pride, they refused to accept. They spoke a dialect of Latin which seemed amusing to the Romans, and to the people of the metropolis their habits seemed provincial. During the civil wars between Marius and Sulla (q.v.) Marius (q.v.) made Præneste his headquarters, but the city was taken and destroyed by Sulla (82 b.c.), who rebuilt it with great splendor and settled a Roman colony there. Under the Empire Præneste was a favorite summer resort, on account of its lofty position. Præneste was renowned for its large and magnificent temple of Fortune, with an oracle much frequented by worshipers. (Cf. *Sortes Prænestinæ*, Cicero, *De Div.*, ii, 41.) During the Middle Ages Palestrina was long a bone of contention between the popes and the powerful Colonna family, and was destroyed in 1436, but afterward rebuilt. In 1630 Pope Urban VIII ceded it to the Barberini. Palestrina is now a squalid town occupying approximately the site of the ancient temple of Fortune; its population in 1909, according to Baedeker, was 7000. Besides the Barberini Palace it contains fine remains of the ancient polygonal walls. The great composer Giovanni Pierluigi da Palestrina was born here. Consult: O. Marucchi, *Guida archeologica dell' antica Preneste* (Rome, 1885); ib., in *Bullctino Comunale* (ib., 1904); R. V. D. Magoffin, "A Study of the Topography and Municipal History of Præneste," in *Johns Hopkins University Studies*, vol. xxvi (Baltimore, 1908). See Fibula Prænestina; Italic Languages.

PRÆNES′TINE BROOCH. See Fibula Prænestina.

PRÆNO′MEN (Lat., forename, from *præ*, before + *nomen*, name). That one of the three names of the freeborn Roman which corresponds to the modern given or Christian name. See Agnomen; Cognomen; Nomen.

PRAET, prät, Jules van (1806–87). A Belgian statesman and historian, born at Bruges. He studied law at Ghent, was appointed archivist of Bruges, later became secretary to Prince Leopold of Saxe-Coburg, and after the latter assumed the title of Leopold I, confidential adviser in the royal suite. In the various difficulties attending the beginnings of the monarchy he was of great assistance. He wrote a *Histoire de la Flandre* (1828), defective owing to the uncritical use of sources, and *L'Origine des communes flamandes* (1829), of much value. But his most important work is his *Etudes sur l'histoire politique des derniers siècles* (3 vols., 1867, 1874, 1884), an admirable series of essays on European politics, in which the analysis of noteworthy historical personages occupies an important place. Consult Wauters, *Notice sur Jules van Praet* (Brussels, 1889).

PRÆ′TOR (Lat., leader, governor, commander; originally *præitor*, from *præ*, before + *ire*, to go). The title of an important magistrate among the ancient Romans. The name meant originally simply leader, and as such was first applied to the two consuls, after the expulsion of the kings. As a separate office the prætorship was created in 366 B.C., open only to patricians as a compensation for the consulship, to which plebeians were now made eligible. (See Licinian Rogations.) Thus the patrician prætor was a sort of third consul, and in fact was called colleague of the consuls, and was accompanied by 6 lictors, as the consuls were accompanied by 12. (See Lictor.) In 377 B.C. the prætorship too was thrown open to the plebeians, and became the highest judicial office within the city and the immediate steppingstone to the consulship. With the growth of Rome's foreign relations and the increase in the city's foreign population, the judicial business became too vast for one magistrate, and in 246 B.C. a second prætorship was founded. Thenceforth the original prætor, known as *prætor urbanus* (city prætor), presided over litigation between Roman citizens, while the foreign prætor (*prætor peregrinus*) presided over cases where one or both of the litigants were foreigners. In 227 B.C. two more prætors were appointed, for the special administration of affairs in Sicily and Sardinia, while Spain received two more in 197 B.C., and in course of time the number was further increased, until it reached the maximum of 18. The next titles of which there is mention are those of *prætores ærarii*, or *ad ærarium*, connected with the national treasury, and *prætores tutelarii*, a sort of judges of probate. The prætorship was ordinarily of annual tenure, and the age required was 30 years. After his year of service in Rome the prætor went as governor to some province.

Bibliography. P. Willems, *Le droit romain* (Paris, 1883); Theodor Mommsen, *Römisches Staatsrecht* (Berlin, 1887); A. H. J. Greenidge, *Roman Public Life* (London, 1901); id., *The Legal Procedure of Cicero's Time* (Oxford, 1901); R. Sohm, *The Institutes*, English translation by J. C. Ledlie (ib., 1901); G. W. Botsford, *The Roman Assemblies* (New York, 1909); F. F. Abbott, *A History and Description of Roman Political Institutions* (3d ed., Boston, 1911).

PRÆTO′RIAN GUARD (Lat. *prætoriæ cohortes, prætoriani*). The bodyguard of the Roman emperors. A *prætoria cohors*, or select guard of the most valiant soldiers, was attached to the person of Scipio Africanus (see Cohort); but it was to Augustus that its institution as a separate force was due. He formed nine cohorts, each consisting of 1000 men (horse and foot) under the command of a prefect; but kept only three of them in Rome, the rest being dispersed in cities not far off. Tiberius, however, assembled the nine cohorts at the capital in a permanent camp, and Vitellius increased the number of the cohorts to 16. The prætorians served at first for 12 and afterward for 16 years; they received double pay; the privates were held equal in rank to the centurions in the regular army, and on their retirement each received 20,000 sesterces. They soon acquired a dangerous power, which they exercised in the most unscrupulous manner, deposing and elevating emperors at their pleasure. Aspirants for the Imperial dignity found it advisable, and even necessary, to bribe them largely; while those who acquired that dignity without their assistance were accustomed on their accession to purchase their favor with liberal donations. The prætorians, however, had no political or ambitious views; they were simply an insolent and rapacious soldiery, fond of substantial gratifications and unmindful as to how they obtained them. After the death of Pertinax (193 A.D.) they actually sold the purple for a sum of money to Didius Julianus; but in the same year their peculiar organization was entirely broken up by Severus, who formed new cohorts altogether out of the best legions serving on the frontiers, which he increased to four times the number of the old. After several other changes they were entirely abolished by Constantine (312 A.D.). Consult the article "Prætoriani Milites," in Friedrich Lübker, *Reallexikon des klassischen Altertums*, vol. ii (8th ed., Leipzig, 1914).

PRÆTO′RIUM (Lat. *prætorium*, neut. of adj. *prætorius*, belonging to the *prætor* (q.v.), transliterated into Gk. πραιτώριον, *praitōrion*). It signified originally the tent of the prætor or general; then the military council gathering there. It also designated the official residence of a provincial governor; after the time of Augustus, a palace or any magnificent dwelling; finally, the Imperial bodyguard. In the New Testament the Greek word is variously rendered, owing to the effort of the translators to convey in each case the local or specific significance of the term. Hence in the Authorized Version it is called "the common hall," margin, "governor's house" (Matt. xxvii. 27); "judgment hall," margin, "Pilate's house" (John xviii. 28, 33, xix. 9); "Herod's judgment hall" (Acts xxiii. 35); and "the palace," margin, "Cæsar's court" (Phil. i. 13). Only in Mark xv. 16, a passage parallel to Matt. xxvii. 27, is it called "prætorium." The Revised Version renders the term in the Gospels by its transliterated form "prætorium," margin, "palace"; in the Acts passage by "palace," margin, "prætorium"; and in Philippians by "prætorian guard." Whatever building the governor occupied at any time was, by virtue of the fact, the prætorium. In Jerusalem this was probably the well-known palace of Herod, described by Josephus (*Ant.*, xv, iv, 3), a fortified structure near the Jaffa gate. It is possible that the reference in Matthew (xxvii. 27) and Mark (xv. 16) is not to any portion of Herod's palace, but to a court elsewhere located and designated prætorium because used for the military council of the garrison. Consult for further details the various commentaries on the passages enumerated above and Sir W. M. Ramsay, *Saint Paul the Traveler and the Roman Citizen* (New York, 1896).

PRÆTORIUS. See PRÄTORIUS.

PRAGA, prä′gȧ. A suburb of Warsaw (q.v.).

PRAGMAT′IC SANCTION (Fr. *pragmatique*, from Lat. *pragmaticus*, from Gk. *πραγματικός*, *pragmatikos*, relating to civil affairs, from *πρᾶγμα*, *pragma*, deed, from *πράσσειν*, *prassein*, to do). A solemn ordinance or decree of a sovereign dealing with matters of primal importance and regarded as constituting a part of the fundamental law of the land. The term originated in the Byzantine Empire and signified a public and solemn decree by a prince, as distinguished from the simple rescript, which was a declaration of law in answer to a question propounded by an individual. The name is given in later European history to several important decrees, of which the principal are: (1) those issued by the Emperor Frederick II in 1220 and 1232 confirming certain customary rights of local authority wielded by bishops and nobles in the German Empire; (2) an ordinance of Charles VII of France for the reformation of the Gallican church, issued in 1438 after the Council of Basel; (3) the decree of the Emperor Charles V, issued in 1547, declaring his Burgundian inheritance indivisible and the perpetual appanage of the house of Hapsburg; (4) and especially to the ordinance of the Holy Roman Emperor Charles VI, who, having no male issue, settled his dominions on his daughter, the Archduchess Maria Theresa. The decree was issued in April, 1713, as a family law of the Hapsburgs, and between 1720 and 1724 was ratified by various national diets under the Austrian crown, becoming thereupon a part of the organic law. The act provided that in default of male issue to Charles VI the Austrian territories, which were declared inseparable, should descend in the female line according to the law of primogeniture. To lend greater security to the act, Charles VI sought to gain first the ratification of the Great Powers, and to this end Austrian policy was directed during the greater part of his reign. Among the guarantors of the sanction were Great Britain, France, Prussia, Russia, and Holland. Nevertheless the death of the Emperor was followed by a speedy repudiation of their pledge on the part of a number of the Powers and an attack on the Austrian dominions by Prussia, Bavaria, Saxony, and France, Spain entering into alliance with the last-named Power. England supported Austria. The conflict is known as the War of the Austrian Succession. Consult Varenbergh, "La pragmatique sanction de Charles VI, sa garantie et son infraction," in *Académie d'archéologie de Belgique*, vol. xxviii (Antwerp, 1872), and *Cambridge Modern History*, vol. vi (New York, 1909). (See AUSTRIA-HUNGARY; CHARLES VI; MARIA THERESA; SUCCESSION WARS.) (5) The settlement of the succession of the Kingdom of Naples, which was ceded by Charles II of Spain in 1759 to his third son and his descendants.

PRAG′MATISM. A term which, first used in print in 1898 by William James (q.v.), has since become widely current to designate first a philosophical attitude and secondly a theory of logic. As a philosophical attitude pragmatism is expressed by James's summary: "Theories thus become instruments, not answers to enigmas, in which we can rest." The attitude is anti-intellectualistic. (See INTELLECTUALISM.) It is opposed to the assumption that the intellect can discover truth in the sense in which truth consists in correspondence between an idea in our mind and some external reality outside of the mind. All views of the world become thus ways that man has of handling his practical problems. For the person of pragmatic temper there is no significance in disputes about questions that have no practical bearing on experience and on life. Whether God or mechanical laws are responsible for the past history of the world is, for James, a meaningless question, for the past is an accomplished fact—it is bagged—and cannot be changed by any theory we may have as to its cause. On the other hand, the question at issue between materialism and theism becomes vital when we look to the future; materialism means that everything before us is cut and dried and that our efforts do not count, whereas theism means a future capable of being made to conform more or less to our ideals.

Pragmatism as a logic has concerned itself so far mainly, if not exclusively, with the question, What is truth? It denies that truth is a correspondence of our ideas with independent and objective fact or with an absolute truth experienced in some transcendental consciousness. Such correspondence, it maintains, never could be discovered, if it existed; and therefore, in accordance with the pragmatic attitude the assertion of such a truth has no significance; it can make nothing in our lives different from what it would be if there were no such truth. In the position taken by pragmatic logic towards competing views of truth, therefore, we see that the general pragmatic attitude becomes particularized in being applied to a special problem. Without the pragmatic attitude the pragmatic logic on its negative side would lose its whole significance. But the pragmatic logic has a positive side also; not content with brushing aside what it considers the irrelevancies of contrasting logics, it develops a positive theory of truth on an empirical basis. It takes the ideas that have been accounted true and tries to determine what it is in them that gives them this rating. James answers: "True ideas are those that we can assimilate, validate, corroborate, and verify. False ideas are those that we can not. But what do the words verification and validation themselves pragmatically mean? They, again, signify certain practical consequences of the verified and validated ideas. They lead us, namely, through the acts and other ideas which they instigate, into or up to, or towards, other parts of experience, with which we feel all the while—such feeling being among our potentialities—that the original ideas remain in agreement. The connections and transitions come to us from point to point as being progressive, harmonious, satisfactory. This function of agreeable leading is what we mean by an idea's verification." An idea thus agrees with reality, in the pragmatist sense of agreement, when it agreeably leads to reality. "To 'agree' in the widest sense with a reality *can only mean to be guided either straight up to it or into its surroundings, or to be put into such working touch with it as to handle either it or something connected with it better than if we disagreed.* Better either intellectually or practically!" It follows that the "truth of an idea is not a stagnant property inherent in it. Truth *happens* to an idea. It *becomes* true, is *made* true by events. Its verity *is* in fact an event, a process: the process namely of its verifying itself, its veri-*fication*. Its validity is the process of its valid-*ation*."

But, while such "simply and fully verified leadings are certainly the originals and prototypes of the truth process," experience "offers indeed other forms of truth process, but they are all conceivable as being primary verifications arrested, multiplied, or substituted one for another." But there are true ideas that are not verified; no attempt is made to verify them; and "they form the overwhelmingly large number of the truths we live by. Indirect as well as direct verifications pass muster. Where circumstantial evidence is sufficient, we can go without eye-witnessing. . . . Verifi*ability* . . . is as good as verification. For one truth process completed there are a million in our lives that function in this state of nascency. They turn us *towards* verification; lead us into the *surroundings* of the objects they envisage; and then, if everything runs on harmoniously, we are so sure that verification is possible that we omit it, and are usually justified by all that happens. Truth lives, in fact, for the most part on a credit system. Our thoughts and beliefs 'pass,' so long as nothing challenges them, just as bank notes pass so long as nobody refuses them. But this all points to direct face-to-face verifications somewhere, without which the fabric of truth collapses like a financial system with no cash basis whatever. You accept my verification of one thing, I yours of another. We trade on each other's truth. But beliefs verified by *somebody* are the posts of the whole superstructure."

The brief exposition of pragmatism given above rests on James's writings; but it is altogether too simple and schematic to suffice for a thorough presentation of the pragmatic logic, which would be out of the question in this article. The most detailed and painstaking development of the pragmatic logic stands to the credit of John Dewey (q.v.) and his former colleagues of the University of Chicago. (See INSTRUMENTALISM.) F. C. S. Schiller (q.v.), of Oxford, has contributed most largely to the controversial development of pragmatism, but his positive work has been in the metaphysical application of pragmatism. (See HUMANISM.) His humanism, however, is admittedly more or less idiosyncratic; for "pragmatism may ultimately lead to a number of metaphysics, each of which will represent a personal guess at a final synthesis of experience, while remaining essentially undogmatic and improvable."

Although pragmatism is still very young, it has had rather an extensive history. C. S. S. Peirce (q.v.) seems to have been the first to make explicit the pragmatic principle, in 1878; James took it up in 1898 and elaborated and popularized it; Dewey deepened it by careful experiential analysis; Schiller aggressively martialized it and called it humanism. A large number of the former pupils of James and Dewey in the United States are somewhat pronounced pragmatists. In Germany pragmatism appears in varying degrees of mildness in the writings of Jerusalem, Jacoby, and others; in France it finds advocates, although Bergson's influence appears to have diverted the interest somewhat—for, while Bergson has some views that are pragmatic, he can hardly be called a pragmatist *sang pur*. In Italy Papini (q.v.) is even more militant than is Schiller in England. But even where pragmatism has not been accepted as a satisfactory attitude or logic, its influence has made itself powerfully felt, and very few alert thinkers of the last decade have been untouched by it. Incidentally it has contributed to a great revival of popular interest in philosophy.

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PRAGUE, prāg (Boh. *Praha*, Ger. *Prag*). The capital of the Austrian Crownland of Bohemia, situated on both banks of the Moldau, 150 miles northwest of Vienna (Map: Austria, D 1). Excluding the suburbs, Prague consists of seven parts: the Altstadt, on the right bank of the river; the old Ghetto, known as the Josephstadt and surrounded by the Altstadt; the Neustadt, which incloses the Altstadt; the Kleinseite, on the slopes of the Laurenzberg along the left bank of the river; the Hradschin, the kremlin of old Prague, lying on an elevation northwest of the Kleinseite; the new quarter of Wischehrad, on the right bank of the river south of the Neustadt; and the industrial quarter of Holeschowitz-Bubna in the northeast.

The Moldau is spanned in Prague by nine bridges, of which the best known is the Karlsbrücke (1357–1507), 546 yards long, with two mediæval towers and many buttresses embellished with statues of saints. They include that of St. John of Nepomuk, supposed to have been thrown into the river here by order of King Wenceslas IV and regarded by the Bohemians as a patron saint of bridges. The most interesting portion of Prague is the Altstadt, which preserves its mediæval appearance. Its centre is the Grosser Ring, a fine square, with a monument (Mariensäule) erected in 1650 in commemoration of the liberation of the city from the Swedes. On the eastern side of the square stands the old Hussite Teyn Church (begun in the fourteenth century), adorned with two striking towers and containing the tomb of Tycho Brahe, marble statues of the apostles to the Slavs, Cyril and Methodius, and a fine winged altar.

Opposite the Teyn Church is the town hall, the oldest parts dating from 1381. It is a handsome building with a tower, and contains the council chamber of the old structure which has been so closely associated with the eventful history of the city. Its balcony is embellished with statues, and the council chamber contains a large painting by Brožik, "Huss before the Council of Constance." Besides the buildings of the famous university (see PRAGUE, UNIVERSITY OF) the Altstadt contains the Rudolphinum, a fine Renaissance edifice on the Rudolfs Quai, with a conservatory of music, an art industrial museum, and an extensive picture gallery, with many works by Bohemian, Dutch, Italian, French, and German masters; the Kreuzherren-Kirche, modeled after St. Peter's; the palace of Count Clam Gallas (1701–12), in the baroque style; the Kinsky Palace, with a valuable library; the Pulverthurm, a relic of the old wall which once separated the Altstadt from the Neustadt; and the Königshof, formerly the palace of the Bohemian kings, now used as barracks.

The Josephstadt formed the Ghetto of Prague until 1848, but is now inhabited mostly by Gentiles. It is the most densely populated portion of the city, and contains the old Jewish synagogue dating from the twelfth century and the curious Jewish burial ground crowded with ancient tombstones having Hebrew inscriptions and symbols denoting the tribe of the deceased.

The Hradschin contains a vast Burg begun, it is fabled, by Princess Libussa and completed by Maria Theresa. In the council chamber of the Burg is shown the window from which the two Imperial councilors were hurled in 1618—the initial act in the Thirty Years' War. The unfinished Gothic cathedral in the Hradschin was begun in 1344 and its choir completed in 1385. Among its interesting objects are the marble mausoleum of the Bohemian kings, the chapel of St. Wenceslas, embellished with precious stones and faded frescoes, and the silver monument to St. John of Nepomuk. In the western part of the Hradschin is the Premonstratensian abbey of Strahow (founded in the twelfth century), with its church of the Assumption, containing the tomb of St. Norbert, the founder of the order, and a picture gallery, library, and natural-history collection. Among other prominent features of the Hradschin are the barracks, formerly the palace of Count Czernin; the Capuchin monastery; the Renaissance palace called the Belvedere, erected by King Ferdinand I in 1538; the archiepiscopal palace; and the Schwarzenberg Palace.

The Kleinseite, though less attractive than the Altstadt and the Hradschin, possesses some buildings of historical and architectural interest. Chief among them are the churches of St. Nicholas and St. Thomas; the palace built by Wallenstein in 1623–30, with a fine garden and many valued relics of the general and a chapel containing paintings by Dürer and others; the palace of Nositz, with a notable picture gallery; the Lobkowitz Palace, with an extensive library; the hall of the Provincial Diet; and the Supreme Court.

The Neustadt, the largest part of Prague, with its fine streets, its modern public buildings, and the general air and stir of a modern city, presents an impressive contrast to old Prague. It contains the imposing Czech National Theatre completed in the Renaissance style in 1883; the Bohemian National Museum, opened in 1891, with its various collections and library; the new German theatre; the courts of justice, formerly a Rathaus; several fine banks and hospitals; an exchange, etc. Among its churches are the Maria Schnee-Kirche, St. Peter's, and the Karlshof. In the quarter of Wischehrad, adjoining the Neustadt, is the modern citadel built on the site of the old fortress destroyed by the Hussites.

During the latter part of the nineteenth century Prague greatly improved in appearance. It also extended its municipal activity, so that at present it owns the water works, the gas and electric plants, the markets, etc. The sanitary conditions have improved, and the park area has been enlarged. The administration is in the hands of a burgomaster and two deputies, an assembly, and a council. The fame of Prague as an educational centre dates from the Middle Ages, when its university was one of the leading institutions of higher learning in Europe. During the latter half of the nineteenth century the struggle for supremacy between the Germans and the Czechs and the revival of a national consciousness among the latter have given a strong stimulus to the intellectual life of the people. This found its expression in the establishment of many national educational institutions at Prague, the centre of Czech culture. In 1882–83 was established the Czech university, whose attendance is about two and one-half times that of the German university here. Some of the secondary schools have also since been duplicated, and show a steady increase in attendance. Besides the 2 universities and the 12 German and 6 Czech secondary schools, Prague has a German and a Czech polytechnic, seminaries for teachers, a school of art, a noted conservatory of music, and many special schools. The most prominent scientific organizations are the Bohemian Academy of Science, Literature, and Art, founded 1890; the Royal Bohemian Scientific Association, about 1770; and the Society for Literature in Bohemia, founded in 1891.

Situated on one of the chief waterways of Bohemia and at the junction of seven railway lines, Prague is naturally the economic centre of the crownland. Its industries are of a wide range, including the manufacture of various metal products, railway cars, leather, cotton goods, gloves, chemicals, beer, and flour. Prague is a great sugar market, and trades extensively in local manufactures and raw products. In population Prague is the third city (after Vienna and Budapest) of Austria-Hungary. The population of the city proper was 170,521 in 1880 and 182,530 in 1890. With an area of 8.1 square miles, Prague had 223,741 inhabitants at the census of Dec. 31, 1910, as compared with 222,831 in 1900. In 1910 Roman Catholics numbered 199,634 (89.2 per cent); Evangelicals, 4593 (2); Jews, 18,041 (8.1). Of the inhabitants in 1910 (excluding 2570 foreigners) persons whose mother tongue was Bohemian (including Moravian and Slovak) numbered 202,067; German, 18,753. The Bohemian, or Czech, element increased from 74.1 per cent in 1900 to 77.1 per cent in 1910, while the German element declined from 7.7 to 6.3 per cent. Suburban to Prague are the three cities of Smichow, Karolinenthal (Karlín), and Köngliche Weinberge (Vinohrady Královské); the combined communal area of the three is 402 square miles, and their communal population in 1910 aggregated 419,395 and 541,504 in 1914, as compared with 326,789 in 1900.

History. Nothing definite is known about the foundation of Prague, but there is evidence that it existed as a town as early as the latter part of the tenth century. As the residence of the kings the town played a prominent part in the early history of Bohemia. The Altstadt obtained municipal rights and was surrounded with walls in the first half of the thirteenth century. The Neustadt was established about a century later. Under the rule of Charles IV Prague became, with the establishment of the university (1348), one of the principal cities of the German Empire. In the following century, however, it became the theatre of the Hussite wars (see Hussites), and many of its churches and a part of its fortifications were destroyed. It soon recovered and entered upon a new period of prosperity, which culminated under Rudolph II. In the seventeenth century came the Thirty Years' War, which began with the defenestration of the Imperial counselors at Prague (1618). In the battle of the White Hill, fought close to the city, the forces of Frederick of the Palatinate were completely defeated by the Imperialists in November, 1620. Prague was taken by the Saxons in 1631 and retaken by Wallenstein in 1632. In 1635 a peace was concluded here between Ferdinand II and the Elector of Saxony. In 1648 the Swedes captured the Kleinseite, on the right bank of the Vltava (Moldau)—the last episode of the Thirty Years' War. The city was taken by the French, Bavarians, and Saxons in 1741, and capitulated to Frederick the Great in 1744 after a devastating bombardment. Frederick won a victory over the Austrians here in 1757, and then unsuccessfully besieged the city. For the history of Prague during the nineteenth century, see the history of Bohemia. The peace of Prague, Aug. 23, 1866, terminated the Seven Weeks' War between Prussia and Austria.

Consult: Erben, *Statistische Handbücher der königlichen Hauptstadt Prag* (Prague, 1873–95); *Oesterreichisches Städtebuch* (Vienna, 1895); Wirth, *Prag* (Leipzig, 1901); F. H. H. von Lützow, *Story of Prague*, in the "Mediæval Towns Series" (New York, 1902); Arthur Symons, *Cities* (new ed., ib., 1906).

PRAGUE, Cosmas of. See Cosmas of Prague.

PRAGUE, Luke of. See Luke of Prague.

PRAGUE, University of. Prague has two universities, one German, the other Bohemian. Of these the older and more famous is the former, which is the oldest of German universities. It was founded by Charles IV in 1348 on the basis of an older school dating from the middle of the thirteenth century, and was organized on the model of the University of Paris, with the four faculties of theology, law, medicine, and arts, and all rights and privileges of a *studium generale*. It has also one college, founded by Charles and endowed by Wenceslas IV. The Hussite movement interrupted the remarkable prosperity of the foundation, as Huss was one of the leading spirits of the institution, and rector in 1403. Owing to an order of Wenceslas IV, growing out of the Hussite disturbances, that the Bohemian nation should have three votes to the German one in the university convocation, the Germans seceded and founded the University of Leipzig (q.v.). Others joined Heidelberg and Cologne. The Hussite movement had been joined to a national Bohemian movement and had developed into a political as much as a religious agitation; the university from the time of the secession lost its cosmopolitan character and became more identified with Bohemian interests and development. In 1419 Catholics were expelled from the university, and in the troublous times that followed it lost most of its students and nearly all its property. In the latter part of the fifteenth century, however, the foundation of many colleges in great part repaired this loss. In the seventeenth century its religious complexion was changed, and in 1654 it was united with the Jesuit college, coming under the influence of that order. The Czech movement of the nineteenth century found expression at the University of Prague, first in the increase of lectures in the Czech language, and eventually in the foundation of the Czech University of Prague in 1882–83, with the three faculties of law, medicine, and arts, to which theology was added in 1891–92. The Czech university has much outgrown its German rival. The number of students in the German university in 1912–13 was 2053; in the Czech university, 4406.

PRAIRIAL, prå′rē′ål′. The ninth month in the French Republican calendar, extending from May 20 to June 18 in the years I–VII and from May 21 to June 19 in the years VIII–XIII.

PRAIRIE (Fr. *prairie*, It. *prateria*, from ML. *prataria*, meadowland, from Lat. *pratum*, meadow). In general, an undulating, grass-covered plain, as distinguished from a forested plain on the one hand and a semiarid region or steppe on the other. The name is applied more specifically to the extensive plain that stretches from southern Michigan and western Ohio across Indiana, Illinois, Missouri, Iowa, Wisconsin, and Minnesota, thus including almost the entire area between the Ohio and the Missouri-Mississippi rivers. West of the Missouri River this level expanse is continued by the Great Plains to the base of the Rocky Mountains, while on the east it merges imperceptibly into the Alleghany plateau. Its surface is unbroken by marked elevations, but the monotony is relieved by the broad undulations and by the channels of the streams tributary to the Ohio, Mississippi, and Missouri, which have been worn down in places so as to expose vertical walls or bluffs 100 feet or more in height. The elevation above sea level ranges from 300 to 1500 feet. The prairies are underlaid by Paleozoic sandstones and limestones in nearly horizontal position; but the surface formation is largely of glacial origin and consists of bowlder clay and sand more or less rearranged and decomposed by weathering and erosion. A fine sandy deposit resembling the loess of China occurs over wide areas in the Mississippi valley. The prairies are characterized by a heavy, rich soil admirably adapted for the growth of cereals, and while formerly covered only with grass and supporting herds of buffalo and deer, they have been brought under a high state of cultivation. As to the characteristics of their vegetation prairies may be divided into two general groups: climatic, which include typical portions of the western part of the Mississippi valley; and edaphic, which are smaller and are developed almost without exception from swamps. Among the theories commonly held to account for the treelessness of the great Western prairies are: (1) the lack of sufficient rainfall; (2) the grazing of animals and the action of fire; and (3) the excessive transpiration, due to wind—all of which prevent the growth of trees. See Hempstead Plains; Illinois; Indiana; United States; etc.

PRAIRIE, The. A novel by J. Fenimore Cooper (1827). It is the last of the Leather-stocking series.

PRAIRIE CHICKEN. See Grouse.

PRAIRIE DOG. A Western American ground squirrel, two species of which (*Cynomys columbianus*, west of the Rockies, and *Cynomys ludovicianus*, east of these mountains) are locally common from the Canadian to beyond the Mexican boundary of the United States. The prairie dog is about a foot long and of robust form, with strong limbs and claws well calculated for digging. Its home is the dry upland plains, where it dwells in colonies, whose permanent towns, or burrows, each marked by a hillock of earth about the entrance, spread densely over many acres under the natural prehistoric conditions, but now sometimes cover hundreds of square miles. The burrows are deep and extensive and at first go down at a very steep slope to a depth of 12 to 15 feet, when they suddenly turn and run in a horizontal direction, and here and there branch into chambers, some of which are elevated and form family rooms. In other rooms fodder is stored, or refuse and dung are deposited. The mound about the hole is packed hard, not only by the tramping of the animals, but by their crowding it down with their noses; this hillock prevents water from running into the burrows when the plain is flooded by heavy rains, and serves also as a tower of observation. The prairie dogs feed on grass and herbage, which is soon exhausted near the burrows, compelling the animals to go farther and farther away for food. This they dislike to do, as it exposes them to attack from enemies; and after a time they prefer to dig a new burrow nearer a supply of food. Thus a town is always spreading and contains many empty burrows. Like other animals habituated to desert regions, they do not drink at all, and the early belief that subterranean pits were dug by them down to a water supply has been proved erroneous. Artesian wells within dog towns have failed to strike water as often as elsewhere. The animals are diurnal and most active morning and evening. They come out daily during the winter, except when it is very stormy; but this practice varies with the latitude and climate.

They are prolific, especially in the southern half of their territory, and would multiply with excessive rapidity were it not for numerous enemies, especially rattlesnakes and other serpents. These are courageously resisted by the prairie dogs, which sound the alarm the moment a snake enters a hole, gather, and proceed to fill the entrance with earth, packing it down, thereby sometimes entombing the snake forever. Probably few snakes go down the passages, which are so steep that they could with difficulty climb out, but depend on lying hidden in the grass and striking down the young squirrels when out at play or in search of food. This is the method of the coyote, kit fox, wild cat, hawks, and owls, who find the dog towns a profitable hunting ground. Badgers, however, can, if they will, easily dig up a burrow and devour the helpless family. The worst enemy is the black-footed ferret, a weasel of the plains, which easily penetrates the burrows, and against whose ferocity and skill the squirrels can make little defense. Every prairie-dog town is also tenanted by many little burrowing owls. See Burrowing Owl.

All these conditions together served in the natural state of things to hold the prairie dogs in check, but the changes brought about by civilization have been so favorable to these little animals, by the reduction of their enemies on the one hand and the augmentation on the other hand of their food supplies by the farmers' plantations of meadow grass, alfalfa, and grain, that they have increased into a very serious pest. The squirrels may be killed by poison in various ways, but best by the use of bisulphide of carbon. A teaspoonful of this cheap liquid is placed upon some absorbent substance (a nodule of dry horse dung or half a corn cob will serve the purpose well) and dropped down the hole, which should then be stopped with earth. The fumes are heavy, sink into the depths of the burrow, and kill the inhabitants. See Plate of Gophers, Lemmings, and Marmots.

PRAIRIE DU CHIEN, prā′rĭ dụ shēn′. A city and the county seat of Crawford Co., Wis., 60 miles south of La Crosse, on the Mississippi River and on the Chicago, Burlington, and Quincy and the Chicago, Milwaukee, and St. Paul railroads (Map: Wisconsin, B 5). It has Campion College, St. Mary's College, and Keewatin Academy, for boys. The ruins of old Fort Crawford, built in 1828, are of historic interest, as are also the Black Hawk grounds, State Park, and the many Indian mounds to be found near by; and the mineral springs in the vicinity make Prairie du Chien of considerable importance as a health resort. It is the commercial centre of a fertile agricultural region, and manufactures woolens, pearl buttons, pickles, barrels, egg cases, veneer, etc. Pop., 1900, 3232; 1910, 3149.

Near Prairie du Chien a fort seems to have been built by the French as early as 1689, but this was soon abandoned and another was built in 1775. The present settlement dates from 1783. The village and fort were surrendered by the English to the United States in 1786, though they were again captured during the War of 1812 and held until 1816. Prairie du Chien was first incorporated in 1872. Consult: "Early Days of Prairie du Chien," in the *Wisconsin Historical Society Collections*, vol. v (Madison, 1868), and Durrie, *Annals of Prairie du Chien* (ib., 1872).

PRAIRIE FOX. The kit fox (q.v.).

PRAIRIE HARE. See Hare.

PRAIRIE PIGEON, or Prairie Plover. A local name in the western United States for both the golden plover and the upland plover (a sandpiper).

PRAIRIE RATTLESNAKE. The small rattlesnake, or massasauga (*Sistrurus catenatus*), of the prairie regions of the central United States. See Rattlesnake.

PRAIRIE WARBLER. A wood warbler (*Dendroica discolor*) of the eastern United States, olive green above, spotted with dull red, and lower parts rich yellow, with conspicuous black streaks upon the cheeks and along the sides of the body. It frequents brushy districts, and its habits, song, nest, and eggs resemble those of the common yellow warbler. Consult Elliott Coues, *Birds of the Northwest* (Washington, 1874), and F. M. Chapman, *Warblers of North America* (New York, 1907).

PRAIRIE WOLF, or RED WOLF. The coyote.

PRAJAPATI, prȧ-jä′pȧ-tē̇ (Skt., lord of beings). The name of a Hindu divinity, the lord of all creatures and the first to practice human sacrifice. In the Rig-Veda the word is used also as an epithet of Savitar (q.v), the revivifying aspect of the sun, and of the invigorating Soma (q.v.). Prajapati's character was essentially that of a creator, and he thus became not only a synonym of Brahma (q.v.), but also of those divine personages who, produced by Brahma, created all existing beings, including gods and demons. Manu names 10 such Prajapatis engendered, through pure meditation, by Brahma, viz., Marichi, Atri, Angiras, Pulastya, Pulaha, Kratu, Prachetas or Daksha, Vasishtha, Bhrigu, and Narada. The Puranas (q.v.) contain many legends about them, together with varying accounts both of their number and origin. In modern India the cult of Prajapati has almost disappeared, although the kumhars, or potter caste, of the Punjab still worship him. Consult: E. W. Hopkins, *Religions of India* (Boston, 1895); A. A. Macdonell, *Vedic Mythology* (Strassburg, 1897); id., *History of Sanskrit Literature* (London, 1913); L. D. Barnett, *Antiquities of India* (ib., 1913).

PRAJNA PARAMITA, prŭj′nä pä′rȧ-mē′tä (Skt., wisdom which has gone to the other shore; absolute or transcendental wisdom). The title of the principal Sutra of the Mahayana school of the Buddhists. Its main object is metaphysical, and its doctrine is the entire negation of the subject as well as the object, teaching that the supreme good, defined by it as the wisdom that releases from transmigration, has no more reality than he who strives to gain it. The beginning of the work is merely a eulogy of Buddha and of the bodhisattvas, who form his retinue. Other parts contain narratives of wonderful phenomena connected with the apparition of Buddhist saints, descriptions of the benefits arising from an observance of Buddhistic doctrine, or verses in which the Buddha is praised by his disciples. Both on account of the extent to which such episodical topics could easily be expanded, as well as by reason of the amplifications of the real substance of the work, several recensions of the Prajna Paramita are in existence. Some of these contain no more than 7000 slokas, or distichs, but others amount to 18,000, 25,000, or even 100,000 slokas. Consult Ghoṣa, "Catasāhasrikā-prajñā-pāramitā: A Theological and Philosophical Discourse of Buddha with his Disciples in 100,000 Stanzas," in *Bibliotheca Indica*, vols. i–xvii (Calcutta, 1902–12).

PRAKRIT, prä′krĭt (Skt. *prākṛta*, natural, unrefined, vernacular; contrast with Sanskrit from *saṁskṛta*, purified). The term Prakrit is applied to all vernaculars of ancient India and indicates a certain state of phonetic decay as compared with the literary standard. The historical development of these vernaculars is usually divided into three stages—primary, secondary, and tertiary. The Prakrits of the primary stage, of which traces are found even in some old Vedic hymns, are furthermore divided into two classes—those of Madhya-dēśa, or Midland, where they have existed from the earliest known times, and those of what is known as the Outer Languages. Their development may be compared to that of the Romance languages, for, although declensional and conjugational processes underwent little change, there is yet a tendency towards simplification of combinations of consonants and broader diphthongs. To a period extending from the sixth to the eleventh centuries belong the secondary Prakrits, varying all the way from Pali (q.v.), the language of Buddhism, which differs little from the Sanskrit standard, to Maharashtri, in which the old consonantal system has, as in modern French, suffered excessive decay; e.g., Skt. *bratam;* Pali, *vataṃ;* Maharashtri, *vaaṃ.* The most important of the secondary Prakrits were Magadhi, the dialect of Behar; Ardhamagadhi, spoken in Oudh and Baghelkhand; Sauraseni, of the district around Muttra; and Maharashtri, the language of Berar. Markandeya Kavindra, writing about the middle of the seventeenth century, states in his *Prākṛtasarvasva* that there were four main divisions of secondary Prakrits—*bhāṣā*, *vibhāṣā*, *apabhraṁśa*, and *pāiśāca.* (See PISACA LANGUAGES.) Under *bhāṣās*, or language proper, he includes 5 dialects, besides 2 others that are closely related. The *vibhāṣās*, or dialects, comprise also 5 dialects, while the *apabhraṁśas*, or patois, include 27 and the *pāiśācas* 11. Of all the Prakrits by far the most important was Maharashtri, which is the one implied by the native grammarians when they speak simply of Prakrit. This is the dialect that is employed sometimes in two slightly modified forms called Ardhamagadhi, and Jaina Maharashtri, in the sacred texts of Jainism (q.v.). An important source for the great majority of Prakrits, however, is the Indian drama. According to the conventions of Hindu dramaturgy only the principal male characters speak Sanskrit. The lower male and all the female rôles are in various Prakrits, often corrupted in course of time by careless or ignorant scribes and editors. On the other hand, women of high birth, their friends, courtesans, and celestial nymphs may speak Sanskrit as well as Prakrit. Prakrit is not derived from classical Sanskrit (see SANSKRIT LANGUAGE), but from a dialect group closely akin to Vedic Sanskrit. As analogues between Prakrit and Vedic Sanskrit may be cited the change of intervocalic *ḍ* to *l*, as Skt. *garuḍa*, name of a mythical bird, Prak. *garula;* instrumental plural in *-ēhim*, as Prak. *vacchēhiṃ*, with trees, Vedic *vṛkṣébhih*, but classical Skt. *vṛkṣāiḥ;* Prak. *rukkha*, tree, Vedic *rukṣa*, not found in classical Sanskrit.

The chief phonological characteristics of Prakrit are the loss of Sanskrit *ṛ*, the shortening of the Sanskrit diphthongs, *ē*, *ō* before consonant groups, the frequent elision of intervocalic *k*, *g*, *j*, *t*, *d*, *p*, *b*, *v*, the common change of medial *kh*, *gh*, *th*, *dh*, *bh* to *h*, the change of *n* to *ṇ* throughout, and of *ś* and *ṣ* to *s* or rarely to *h*, and the simplification of consonant groups.

In morphology the inflection is characterized especially by the growth of *a* stems at the expense of the *r-* and consonant stems, as Skt. *pitar*, father, but Prak. *piara;* Skt. *karman*, deed, Prak. *kamma.* The old dual is lost excepting in *dō, duvē, bē,* two; and the genitive assumes the functions of the dative. The pronominal declension is to a very large extent influenced by the nominal, while in all periods of Sanskrit the two systems are kept distinct. In conjugation there is but one system, apart from some scattered forms, as contrasted with the nine present formations in Sanskrit. Verbs are, therefore, conjugated according to the Sanskrit *a* class, as Skt. *vartati,* turns, Prak. *vaṭṭaï.* Excepting the past participle the middle voice has almost disappeared. The tense system is extremely meagre, consisting of only present and future. Of the imperfect, aorist, and perfect some sporadic examples have survived. These tenses are regularly formed in Prakrit by *bhū* and *as,* to be, with participles, as *gaō atthi,* is gone, Skt. *jágāma* (classical Skt. also *gatō 'sit*). The moods are the indicative, optative, and imperative, but the subjunctive, as in classical Sanskrit, is lost. As is natural, the dialects differ much from one another in regard to inflection and frequency of forms. Thus, the ending of the second person plural present indicative (*-tha* in Sanskrit) is *-ha* in Maharashtri, Jaina Maharashtri, and Ardhamagadhi, *-dha* in Sauraseni and Magadhi, *-hu* in Apabhramsa; the optative is very common in Ardhamagadhi and Jaina Maharashtri, comparatively rare in Maharashtri, and almost never found in the other dialects.

Since the Prakrit forms in the literature have been corrupted usually by scribes, the most trustworthy sources are the native grammarians, especially Hemacandra (ed. and trans. by Pischel, Halle, 1877–80), the most complete, although rather late, dating about the twelfth century, Vararuci (ed. and trans. by Cowell, London, 1868, and ed. by Tailanga, Benares, 1899), the earliest, and Canda (ed. by Hoernle, Calcutta, 1880). The Apabhramsa is treated in the *Prakṛtapiñgālasūtra,* edited by Sivadatta and Parab (Bombay, 1894). There are also several grammarians whose works exist only in manuscript, and a lexicon by Dhamapāla (ed. by Bühler in Bezzenberger's *Beiträge zur Kunde der indogermanischen Sprachen,* vol. iv, Göttingen, 1878). The literature proper is quite extensive. It includes not only parts of the Sanskrit drama as well as the Jaina texts already mentioned, but also epic and lyric poetry. The former class is represented by two Maharashtri poems. Of these the first is the *Sētubandha* (Building of the Bridge), also called *Rāvaṇavaha* (Death of Ravana) by an unknown author, but frequently erroneously attributed to Kalidasa (q.v.). It was known as early as the seventh century, and deals, as its name implies, with the Rama cycle. (See RAMAYANA.) It has been edited and translated by Goldschmidt (Strassburg, 1880–83) and by Sivadatta and Parab (Bombay, 1895). The second epic is the *Gaüdavaha,* an historical poem by Bappaïrāa (Skt. *Vākpatirāja*) about the beginning of the eighth century (ed. by Pandit, Bombay, 1887). The lyric is represented by the *Sattasaī* (Seven Centuries) by Hāla, who lived probably between the third and seventh centuries, at any rate before 1000. This collection of beautiful lyrics has been edited and translated by Weber (Leipzig, 1881) and again edited by Durgaprasad and Parab (Bombay, 1889). In the drama we have the *Karpūramañjarī* of Rājasekhara (q.v.). Other works were composed in Prakrit, such as the *Bṛhatkathā* (Great Story) of Gunadhya, now lost, which formed the basis of Somadra's *Kathāsaritsāgara,* while the *Gītagōvinda* of Jayadeva (q.v.) was apparently adapted from an Apabhramsa original.

About the eleventh century arose the tertiary Prakrits. Thus, Sauraseni, having originally developed from the Madhya-dēśa group, gave rise to Western Hindi (spoken in 1901 by 40,714,925 persons) and Panjabi (spoken by 17,070,961 persons). From the cognate dialect, Avantī, sprang Rajasthani (10,917,712 speakers) and Gujarati (9,439,925 speakers); from Ardhamagadhi, Eastern Hindi (22,136,358 speakers); and from a Vrachada Apabhramsa, Sindhi (3,494,971 speakers). Maharashtri, which developed from one of the Outer Languages, has given the modern Marathi (18,237,899 speakers) and the cognate Magadhi, divided into the modern Bihari (34,579,844 speakers), Oriya (9,687,429 speakers) (see URIYA), Bengali (44,624,048 speakers), and Assamese (1,350,846 speakers). It is generally believed that the languages of the Madhya-dēśa, or Midland, are the outgrowth of the language of the Aryans of the second invasion, while the speakers of the Outer Languages, passing through the Panjab on their way to the Madhya-dēśa, drove before them a number of Aryan settlers towards the south, east, and west, with the result that the languages of these districts became more closely related to the Vedic than to those of the Madhya-dēśa.

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PRAKRITI, prä′krē-tē (Skt. *prakṛti,* element, foundation). In Hindu philosophy, potential matter, which must be carefully distinguished from nature, for it exists only conditionally, and develops consciousness only when beheld by Purusha, or Man, who may thus be called the efficient cause of the world as contrasted with its material cause, Prakriti. The union of these two principles gives rise to Buddhi, or perception (also called Mahat, or the great), as well as to Ahaṁkara, or belief in the existence of the ego, and the Tanmatras, or elements of the senses, both in their subjective and objective aspects, to which *manas,* or perception, is added. Prakriti is uncreated and is coeternal with Brahma (q.v.). Manas, the five Tanmatras, Buddhi, and Prakriti are often called the eight Prakritis, the first seven being productive as well as produced, while the primal Prakriti has the distinctive epithet *avyakta,* or unmanifested. Consult Max Müller, *Six Systems of Indian Philosophy* (New York, 1903).

PRAM, präm, or **PRAAM** (Fr. *prame*, Dutch *praam*, Ger. *Prahm*, *Prahme*, from OChurch Slav. *pramŭ*, Pol. *prom*, ferry; ultimately connected with Skt. *par*, to cross, Eng. *fare*). A large flat-bottomed boat or lighter used in the continental ports of the North Sea and Baltic for loading and unloading merchant ships.

PRAM, präm, Kristen Henriksen (1756–1821). A Danish poet and editor, born in Norway of Danish parents. He was a man of wide learning and great mental activity. The number of his works, however, is much greater than their value. Of his poems only *Emilies Kilde* need be mentioned. His principal work was done for the *Minerva*, a monthly critical journal published in Copenhagen, of which he was one of the founders. He was sole editor from 1790 until Rahbek took charge in 1794. His works were edited by Rahbek (6 vols., 1824–29).

PRANG, Louis (1824–1909). A German-American engraver, lithographer, and publisher. He was born in Breslau, Germany, participated in the revolutionary movement of 1848, emigrated to the United States in 1850, and settled in Boston, where he became successively a wood engraver (1851), a lithographer (1856), and a publisher (1861). He made a specialty of color printing, reproducing oil paintings and water-color facsimiles of holiday cards, etc., and later originated the Prang method of art instruction in public schools, publishing the books and material needed for the carrying out of that method. He was president of the Prang Educational Company, of Boston. He wrote *The Prang Standard of Color* (1898). His wife, Mary Dana Hicks, also became well known as an art educator.

PRASE, prāz (Fr. *prase*, leek-green, from Gk. πράσον, *prason*, leek). A transparent to translucent cryptocrystalline variety of quartz, varying in color from a dull leek to deep green. It is sometimes cut as a gem. Specimens of prase are found on Staten Island, N. Y., and at various other places in the United States, none of which, however, are of a quality suitable for gems.

PRA'SEODYM'IUM (Neo-Lat., from Gk. πράσιος, *prasios*, leek-green + *didymium*, q.v.). A metallic chemical element found associated with the similar element neodymium (q.v.). Its chemical symbol is Pr; its atomic weight is 140.6. The element forms two distinct oxides, corresponding respectively to the formulæ Pr_2O_3 and PrO_2, and a hydroxide of the formula $Pr(OH)_3$. The chloride of praseodymium, $PrCl_3$, is colored green in both the anhydrous and the hydrated states. The nitrate, $Pr(NO_3)_3 \cdot 6H_2O$, combines with the nitrates of rubidium and ammonium to form double salts. Pure praseodymium metal was obtained by Muthmann and Weiss in 1904 by the electrolysis of the fused anhydrous chloride; it has a specific gravity of 6.48, and melts at 940° C. (1724° F.).

PRASLIN, Eugène Antoine Horace, Comte de Choiseul-. See Choiseul-Praslin.

PRATER, prä'tẽr, The. The principal park of Vienna (q.v.).

PRATI, prä'tė, Giovanni (1814–84). An Italian poet, born at Campo Maggiore in the Giudicarie. He studied law at Padua, but gave more attention to poetry than to jurisprudence. His first notable poem was the *Edmenegarda* (1841), a work which shows the influence of Byron and Lamartine. Going to Milan, he there published the *Canti lirici*, the *Canti del popolo*, and the *Ballate*, all of which reflect his civic feelings as well as his adherence to the romantic doctrines. At Turin in 1844 he put forth the *Memorie e lacrime* and the *Nuovi canti*. On account of his *Albertismo*, glorifying Charles Albert, he was expelled from Tuscany by order of Guerrazzi, who was then in power, and took refuge in Piedmont. With the change of capital he passed from Turin to Florence and thence to Rome, becoming Counselor of Public Instruction and Senator in 1876. He died at Rome. To the later period of his life belong two collections of verse, the *Psiche* (1875) and the *Iside* (1878), which contains his best lyrics of this time. Of sensitive spirit and quick fancy, he lacks robustness of thought. Some of his verse ranks with the best modern lyric poetry, but some of it is very poor. He attracted many followers, but created no school. Consult his *Opere varie* (5 vols., 1875), and De Gubernatis, *Ricordi biografici* (Florence, 1873).

PRAT'INAS (Lat., from Πρατίνας). A Greek poet, born in Phlius in the Peloponnesus, who lived in Athens about 500 B.C. According to Suidas he was a contemporary and rival of Æschylus, and was the first to introduce the satyric drama into Athens. He also wrote tragedies, lyrics, and *hyporchemata*, a kind of choral ode, of which a considerable and interesting fragment has been preserved by Athenæus (xiv, 617). For the fragments of his lyrics, consult Bergk's *Poetæ Lyrici Græci* (Leipzig, 1843; new ed., 1914); also Christ-Schmid, *Geschichte der griechischen Litteratur*, vol. i, part i (6th ed., Munich, 1912).

PRATO, prä'tō, or Prato in Toscana. A city in the Province of Florence, Italy, situated on the Bisenzio, 11 miles northwest of Florence (Map: Italy, C 3). The city is well built, surrounded by walls, and protected by a citadel. The cathedral, partly Tuscan-Romanesque and partly Gothic, was completed in 1320. The Madonna delle Carceri is a church in the Renaissance style, built in 1485. There are several other churches, a town hall with a picture gallery, a music academy, and a library of 25,000 volumes. The city has a Gymnasium, a lyceum, and a technical school. The industries are straw plaiting and manufactures of woolen and cotten goods, silk thread, biscuits, hats, and machinery. There are also iron and copper works and productive serpentine quarries. Pop. (commune), 1901, 51,453; 1911, 53,750, (town), 17,200. Prato was an independent city before it became subject to Florence in the fourteenth century.

PRÄTORIUS, prȧ-tō'rē-ụs, Michael (1571–1621). A German composer and writer, born at Kreuzburg. He occupied the position of kapellmeister at Lüneburg, and later was kapellmeister, organist, and secretary to the Duke of Brunswick. With the exception of these facts nothing is known of his life. Among his compositions are: *Musæ Sioniæ*, a collection of 1244 vocal numbers in nine parts; *Eulogodia Sionia* (1611); 60 motets; *Missodia Sionia* (1611); *Terpsichore* (1612), which included dance pieces by Prätorius and some French composers; *Puericinium* (1621); 14 church songs; and many anthems, songs, and contrapuntal pieces. His great work, *Syntagma Musicum* (1615–20), is beyond question the most valuable extant treatise on contemporary musical instruments, especially the organ. Prätorius was a skillful composer, but is of more value to the musical historian for his erudite treatises.

PRATT. A city and the county seat of Pratt Co., Kans., 80 miles west of Wichita, on the Ninnesch River and on the Chicago, Rock Island, and Pacific, the Atchison, Topeka, and Santa Fe, and the Anthony and Northern railroads (Map: Kansas, D 7). It is in a productive farming and stock-raising district, and has a large State fish hatchery and fine courthouse and school buildings. The commission form of government has been adopted. Pop., 1900, 1213; 1910, 3302.

PRATT, BELA LYON (1867–). An American sculptor. He was born at Norwich, Conn., and studied at the Yale School of Art, at the Art Students' League, New York, under Saint-Gaudens, and in Paris under Falguière and Chapu. After 1893 he was instructor in modeling at the Boston Museum of Fine Arts. His best work is plastic in conception and refined in modeling. Charming ideal works include "Fountain of Youth," "Study of a Young Girl," the decorative panels "Music," "Drama," and "Dance," in the Boston Opera House, and the figures "Philosophy," Congressional Library, and "Science" and "Art," Boston Public Library. His best-known monuments are the Soldiers and Sailors Monument (Malden, Mass.), "Andersonville Prison Boy" (Andersonville, Ga.), "Spanish War Soldier" (St. Paul's School, Concord, N. H.), "Butler Memorial" (Lowell, Mass.), "Army Nurses' Memorial" (State House, Boston). Among his intensely personal portraits are the busts of Phillips Brooks (Harvard University) and Bishop Huntington and the statues of General Stevenson (State House, Boston) and Dr. Coit (St. Paul's Church, Concord, N. H.). To the Chicago and Buffalo expositions he contributed colossal groups. Pratt became an associate of the National Academy (1900), was awarded a gold medal at the Panama-Pacific Exposition, San Francisco (1915), and, also in 1915, received an honorary degree of A.M. from Harvard.

PRATT, CHARLES. See CAMDEN, first EARL OF.

PRATT, CHARLES (1830–91). An American merchant and philanthropist, born at Watertown, Mass. He removed to New York City in 1851 and began his business career in the oil and petroleum trades. In 1879 he became president of the board of trustees of Adelphi Academy, in Brooklyn, and in 1887 he founded Pratt Institute (q.v.), in Brooklyn.

PRATT, ENOCH (1808–96). An American philanthropist, born at North Middleboro, Mass. In 1831 he settled in Baltimore, where he soon became prominent in the iron trade, as well as in financial circles. He founded the House of Reformation and Instruction for Colored Children at Cheltenham, Md., the Maryland School for the Deaf and Dumb, at Frederick, and the Pratt Free Library, which he presented to the city of Baltimore and which was opened in 1886.

PRATT, ORSON (1811–81). A Mormon apostle, born at Hartford, N. Y. He received only a common-school education, but in later life managed, despite great difficulties, to acquire considerable knowledge, particularly of Hebrew and mathematics. He became a member of the Mormon church in 1830, and soon rose high in the organization, becoming one of the Council of Twelve in 1834 and one of the Twelve Apostles in 1835. He was accounted one of the most eloquent preachers in the church, and made numerous missionary journeys to England and elsewhere. Because of his championship of his faith as a writer and speaker, he became known as the Paul of Mormonism. Pratt was many times a member of the Utah Assembly and was several times its Speaker. From 1874 until his death he was church historian and church recorder. He was also professor of mathematics in the University of Deseret. In 1854 he discovered the law of planetary rotation, and wrote a number of books on mathematical subjects. His published works include: *Divine Authenticity of the Book of Mormon* (1849); *The Great First Cause* (1851); *Cubic and Biquadratic Equations* (1866); *Key to the Universe* (1866); *The Bible and Polygamy* (1870).

PRATT, PARLEY PARKER (1807–57). A Mormon apostle, called the Isaiah of his people, brother of Orson Pratt. He was born in Burlington, N. Y., joined the Mormons in 1830, and five years afterward had risen to the dignity of one of the Twelve Apostles. He worked as a missionary in the East and the Middle West; in 1840 was sent to England and at Manchester established and for a short time edited the *Millennial Star;* and on his return to America accompanied the party which first visited the valley of the Great Salt Lake, in which Parley's Peak and Parley's Cañon were named for him. After missionary work on the Pacific coast he set out for the East, but was murdered near Van Buren, Ark. His works include: *Voice of Warning* (1837); *History of the Persecutions in Missouri* (1839); *Key to the Science of Theology* (1854).

PRATT, SAMUEL JACKSON (1749–1814). An English writer, better known in his day as COURTNEY MELMOTH. His father was a brewer of St. Ives in Huntingdonshire. The son was ordained in the English church, but he soon abandoned the pulpit for the stage. For several years he performed with little success in London, the provinces, and Ireland. Pratt published an immense number of books, some of which went through several editions and were translated into French. They comprise verse, travel, criticism, biography, and plays.

PRATT, SILAS GAMALIEL (1846–1916). An American composer, born in Addison, Vt. His musical education was obtained under native teachers until he was 22 years old, when he went to Berlin to study piano under Bendel and Kullak and composition under Kiel. On a subsequent visit he also studied score reading with Dorn. He organized the Apollo Club of Chicago in 1871. In 1890 he was appointed professor of piano in the New York Metropolitan Conservatory and in 1906 removed to Pittsburgh, where he established the Pratt Institute of Music and Art. He arranged and conducted many festivals and frequently, both in the United States and in Europe, gave concerts of his own works. As a composer he decidedly favors the larger forms. His works include three operas, *Zenobia* (1882), *Lucille* (1887), *The Triumph of Columbus* (1893); three symphonies; two symphonic poems, *Sandalphon* and *A Tragedy of the Deep* (after the *Titanic* disaster); a *Centennial Overture;* a festival overture, *The Voyage of Columbus;* a suite for orchestra, *The Tempest;* songs and piano pieces.

PRATT CITY. Formerly a city in Jefferson Co., Ala., but annexed to the city of Birmingham in 1910.

PRATT INSTITUTE. A coeducational school for art and industrial training, established in Brooklyn, N. Y., in 1887 by Charles Pratt (q.v.). The institute comprises normal, technical, and trade departments, with a total attendance in 1914–15, allowing for duplications, of 3620, distributed as follows: school of fine and applied arts, 996; school of household science and arts, 1557; school of science and technology, 1337; kindergarten, 101; library, 23; gymnasium, 201. The institute conducts both day and evening classes, and has a liberal endowment, amounting in 1914 to $5,476,715.05. The buildings, which number 13, are well equipped with excellent laboratories and museums, and were valued in 1914 at $1,787,197.77. The income of the institute was $272,152.43. The library contains 109,098 volumes. A banking institution, known as the Thrift, is maintained for saving and investment by the students and others. The management is in the hands of a board of seven trustees, under the presidency of Charles M. Pratt.

PRATZ, pràts, LE PAGE DU (?–1775). A French explorer in America. He was born in the Low Countries, served in the French army, and, about 1718, having acquired an interest in the French Compagnie d'Occident, went to New Orleans. His attempts to found a colony were unsuccessful, but he explored the basins of the Missouri and the Arkansas, spending eight years inland. Du Pratz returned to France in 1734. He published *Histoire de la Louisiane* (1758), a work of considerable historic value.

PRAWN (formerly also *praun, prane,* probably from Lat. *perna,* sea mussel, ham). A shrimplike crustacean of the family Palæmonidæ, remarkable for a long serrated beak projecting from the carapace. Many of them are semitransparent and exhibit very fine colors; they are also very active creatures and most interesting inmates of an aquarium, but are excessively voracious, and are likely to make great havoc among its other inhabitants. The common European prawn (*Palæmon serratus*) attains a length of 3 or 4 inches. It is even more esteemed for the table than the shrimp. Several species of edible prawns occur on the coasts of the United States, the best known and most abundant of these being *Palæmonetes vulgaris.*

PRAXIT'ELES (Lat., from Gk. Πραξιτέλης). A celebrated sculptor of ancient Greece, of whose life little is known with certainty, except that he was a citizen of Athens and lived in the fourth century B.C. Pliny gives Olympiad 104 (364–361 B.C.) as his date, and Vitruvius says he worked on the Mausoleum at Halicarnassus, about 353 B.C. The former date seems connected with the battle of Mantineia and the activity of Praxiteles, Cephisodotus (q.v.), perhaps an elder brother, and other Athenian artists at this period in the Peloponnesus. There is nothing in the statements about Praxiteles that indicates artistic activity on his part after 330 B.C. His most famous works have perished, and are known to us, if at all, only through Roman copies. The most famous was the Aphrodite of Cnidus, which Pliny calls the finest statue in the world. In it the goddess was represented as having just laid aside her clothing to enter the bath; she was naked, but, while conscious of her beauty, showed plainly her reluctance at displaying it even to herself. The only good complete copy is a statue in the Vatican. The best head is in private possession in Berlin. The statue shows how the ideals of the fifth-century art had been modified. The gods and goddesses of this period have lost the superhuman element and are little more than idealized men and women. Another famous statue was the Eros of Thespiæ, by some thought to be the original of the Eros of Centocelli in the Vatican, though this is doubtful. Praxiteles was celebrated for his satyrs, and two very frequent types may with probability be referred to his originals. One is the youthful satyr who pours wine from a pitcher in his raised right hand into a bowl in his left, well represented by the Palermo copy; the other is the resting satyr, best known from the Capitoline statue immortalized by Hawthorne in his *Marble Faun.* Another work is one reproduced in the statues which represent the youthful Apollo playfully threatening with an arrow a lizard crawling towards him on a tree trunk, which must be Praxiteles' "Apollo Sauroctonos" (q.v.). More fortunate than other artists of antiquity, Praxiteles is known to us by one undoubted original, the Hermes of Olympia, which was found May 8, 1877, during the excavation of the Heræum, at Olympia, where it was seen by the traveler Pausanias. The youthful god is here represented as the protector of his baby brother Dionysus. He rests his left elbow on a tree trunk, over which his cloak is hung, while on the lower arm sits the baby stretching one hand towards some object (perhaps a bunch of grapes held in the extended right hand of the god). The attitude of the god is easy and the pose graceful, giving opportunity for a variety of contrasting curves, while the technical execution is beyond praise. But the chief beauty of the work is in the wonderful head, which is strong and thoughtful yet full of sensitiveness and delicacy. The lines are finely curved, and in the modeling every part receives equal attention, so that the effect is produced by an infinite number of details, without giving undue prominence to any part, thus contrasting somewhat strongly with the methods of Scopas (q.v.). In sharp contrast to the perfection of the god is the crudeness of the figure of the child; in children, evidently, Praxiteles had no interest. Another work which makes strong claim to being an original of this artist and which, if not done by Praxiteles himself, was almost certainly executed by his assistants from his drawings, is the Basis from Mantineia, where on three slabs is reproduced the strife of Apollo and Marsyas in presence of the Muses. The figures are in low relief and are full of grace, though without the perfection which characterizes the Hermes. A fine marble bust found at Eleusis is also regarded by many competent judges as the original of a Eubuleus by Praxiteles. It certainly shows strong resemblance to the Satyr and other works of this artist, but the identification cannot be regarded as certain.

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sage of Greek Art (New York, 1913), also general histories of Greek art. See FAUN OF PRAXITELES; GREEK ART, II (*c*), *Age of Praxiteles and Scopas;* and Plate of POLYCLITUS AND PRAXITELES.

PRAY, prä′ĕ, GEORG (1723–1801). A Hungarian scholar and historian, born at Neuhäusel. In 1745 he entered the Jesuit Order and subsequently taught in various academies. Upon the suppression of the Jesuits by Clement XIV he was appointed royal historiographer of Hungary and in 1777 custodian of the library of the University of Buda (removed in 1784 to Pest). In 1790 he became canon in Grosswardein and later abbot of Tormowa. He is to be ranked with Stephen Katona (1732–1811), also a Jesuit, as a founder of scientific Hungarian history. His publications, strongly patriotic in tone, include *Annales Veteres Hunnorum, Avarorum et Hungarorum 200 ad 997* (1761); *Annales Regum Hungariæ* (1763–70); *Specimen Hierarchiæ Hungaricæ* (1776–79).

PRAY, ISAAC CLARK (1813–69). An American journalist, playwright, actor, and theatrical manager, born in Boston. He graduated at Amherst College in 1833 and entered newspaper work in his native city, but soon began writing plays. In England, in 1846, he appeared as an actor in *Hamlet* and *Othello.* In 1850 he became dramatic critic for the New York *Herald* and later for a time he edited the Philadelphia *Inquirer.* He engaged successfully in theatrical management also, besides being the author of *Virginius* and about 30 other plays. Among his works are *Prose and Verse* (1836); *Poems* (1837); *Book of the Drama* (1851); *Memoirs of James Gordon Bennett* (1855).

PRAY, JAMES STURGIS (1871–). An American landscape architect. He was born in Boston, was educated at Harvard College and at the Bussey Institution and Arnold Arboretum in connection with Harvard, and was employed by Olmsted Brothers of Brookline, Mass., from 1898 to 1903. He was afterward engaged in independent practice until 1906, when he became a member of the firm of Pray, Hubbard, and White. At Harvard he was appointed assistant professor in 1905, chairman of the school of landscape architecture in 1909, and Charles Eliot professor in 1915, succeeding F. L. Olmsted (q.v.). Pray contributed to architectural journals, to *Landscape Architecture,* and to other publications, and is author of *City Planning* (1913).

PRAYER (OF. *priere,* Fr. *prière,* from ML. *precaria,* prayer, from Lat. *precari,* to entreat; conected with OChurch Slav. *prositi,* Skt. *prach,* to ask, Goth. *frah,* I asked, OHG. *frāgēn,* Ger. *fragen,* AS. *frignan,* prov. Eng. *frain,* to ask). In a broad sense, a verbal address made to a spiritual being. Such a communication usually embodies a petition, but may also contain confession, apology, thanksgiving, tidings, explanation, or meditation. In general, prayer, which in the higher religions has become the greatest religious act of the believer, is in the lower religions a mere accompaniment of sacrifice, explaining for what god the gift is intended and what the giver desires. "Here is butter; give us cows" is the typical prayer of the primitive religions. From the point of view of comparative religion the main characteristics of prayer may be arranged under several heads. 1. *Universality.* It would seem that the act of prayer must be as general as belief in spirits, i.e., common to humanity. Occasionally, as in some African tribes, certain of the gods are considered too exalted to listen to ordinary persons, but should be addressed through the medium of an intercessor. Minor gods, on the other hand, are open to appeal from any quarter. Prayer is offered also to the departed souls of the family, who are supposed to exercise a sort of guardianship over their kindred. In all lands, probably, hunters and fishermen entreat the particular patron of their craft, or the spirit which resides in the fetish they carry. Thus, African boatmen, while crossing a river, offer prayer to a crocodile as a divine being. In Australia also it is said that any person whosoever may approach the abode of a spirit, to whom is addressed information and advice, on which the latter is expected to act. From such testimonies it may be inferred that prayer, in a wide sense, is universal and that supposition of its absence has arisen from misunderstanding or limitation of the term to one familiar type. 2. In early religion, *simplicity.* Primitive prayers are usually plain, direct, and for immediate wants. The Papuans sacrifice to the ancestral spirits and say, "Good father, here is food for you. Eat it. Be kind to us on account of it." Ceremonies connected with special occasions or the beginning of special enterprises were accompanied by simple statements of wants. "Let food grow for us"; "Bring rain for our crops"; "Make our hunting successful"; "Give children." "May we conquer our enemy and bring back many heads." Prayers like these are common among the primitive races. 3. *Growing formalism.* Prayer early began to be formalized. Three influences tended to this: (*a*) Any permanent or frequently recurring needs tended to formalize the terms in which aid was asked from the gods. The recurring seasons of the year brought seedtime and harvest, the need of rain, and thanks for the crops; the constant pressure of enemies, the need of food, the operations of hunting and fishing, frequent sickness, all aided the repetition of prayers, especially if any form had been found particularly effective. (*b*) Prayer, like other parts of worship, takes its form from social intercourse. The god must not be approached with less formality than the chief; and when, in the growth of civilization, the ruler is surrounded with pomp and circumstance and petitions to him are prefaced with adulation and formality, the forms of prayer follow suit. Prayers must be expressed in set terms and uttered in attitudes of humility—kneeling, or prostrate on the ground, or with many genuflections. (*c*) The influence of the priesthood (see PRIEST) is in the same direction. Their natural tendency is to make everything connected with worship more elaborate, not merely to enhance their own power, but to add dignity to the worship. As the nation gains in the sense of order and beauty, prayer naturally follows and is expressed in the finest poetry and with the deepest reverence of which the race is capable. The Vedic hymns in India and prayers in the Babylonian, Egyptian, and Hebrew religions illustrate this. 4. *The decay of prayer.* In many religions the growing formalism issues in the passing of prayer into magic. The form is regarded as itself efficient, compelling the gods to fulfill the desires of the suppliant. Repetition may enhance its value, as when the Hindu repeats "Ram, Ram" or "Siva, Siva" hundreds of times. Sometimes the god disappears entirely from consciousness and the prayer becomes a form with magic power in itself. The test is this: when the utterance is conceived as addressed to a spirit or god who can hear, it is prayer; when it is believed to accomplish a result without the intervention of any personal power, it is magic. 5. *Imprecation.* As prayer is employed in order to obtain benefits for the pleader, so by a natural antithesis it is used to injure enemies, on whom it invokes the divine anger. This function of cursing is as ancient and universal as that of blessing. It is the regular business of shamans and medicine men to bring disaster on foes, cause their injury and death, blight their crops, and destroy their armies. In the same manner prayer is employed to undo the evil spirits, as in old Babylonian exorcistic formulas and in the exorcisms of the early Christian Church.

In the Christian sense, prayer is any voluntary expression of communion with God, whether formal or informal, brief or prolonged, individual or collective. Adoration, thanksgiving, confession, intercession, are all joined with petition in Christian prayer. It rests upon the appreciation of the loving care of the all-wise and all-powerful Father. It is fundamental that the praying Christian must be perfectly submitted to the will of God and desirous of finding more completely what is its application to his own conduct and affairs. His petitions may then embrace the supply of all his wants, physical and spiritual; and he may be sure that he will be heard and answered as God's infinite wisdom shall see best for him and all concerned in his welfare. Christian prayer is in the spirit of confidence and humility which Christ taught. It is prayer as Christ prayed.

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PRAYER, Week of. A season marked by special devotional meetings among Christians of many denominations throughout the world at the beginning of each new year. It originated in the Presbyterian mission of Lodiana, India, in 1858. Reports of the remarkable religious awakening in the United States the year before having reached India (see Revivals, Religious), the members of this mission, at their annual meeting in November, issued an invitation for a universal concert of prayer, to be held yearly, beginning with the first week in January, 1860. The request was taken up by the Evangelical Alliance, which was already using that week as a time of prayer, and met with a hearty response, and the week of prayer has been regularly observed ever since.

PRAYER BOOK, Common. The name commonly given to the service books used in public worship by the churches of the Anglican communion, designated on the title-page as *The Book of Common Prayer, and Administration of the Sacraments, and other Rites and Ceremonies of the Church.* As the only official liturgical book of these churches, it thus contains in small compass all that was left by the reformers of what in the Roman Catholic church is spread out into the missal, breviary, pontifical, and ritual. The purpose of the compilers was explicitly, in addition to substituting English for Latin and removing all that they considered "superstitious or ungodly" in the pre-Reformation books, to simplify and abridge the service so that the laity might take an intelligent part in it. The process began in the reign of Henry VIII, but the earliest complete book was that published in 1549 and known as the first prayer book of Edward VI. It was drawn up with great prudence, altering as little as possible what had been familiar to the people. This book was compiled by Cranmer and Ridley, assisted by 11 other divines, and revised by Convocation. The matins, lauds, and prime of the breviary were combined into the "order for morning prayer," while the evening prayer was made up from vespers and compline. The communion service was largely based on the old English missals, especially that of Salisbury, which had been the one most used. The ordination services were added in 1550.

The influence of the more radical and especially the continental reformers (such as Bucer and Peter Martyr) was exerted in favor of a more thoroughgoing change, and a revised book, the second prayer book of Edward VI, appeared in 1552, marking the furthest point of departure from the older ways. Many of the ancient ceremonies which had been retained in the first book were now omitted; the surplice for priests and deacons and the rochet for bishops were prescribed as the authorized vestments, whereas it is to the standard of the first book that the ritualistic party in modern times appeals for sanction (see Ornaments Rubric, The); prayers for the dead were omitted, and the formula used in the communion of the people was made to satisfy a Virtualist or even a Zwinglian view of the sacrament. (See Lord's Supper.) In 1559, however, under Elizabeth, who had little sympathy with the extreme and aggressive reformers, such changes as were made were in the nature of a return to the first book; and some further changes made by James I in 1604, after the Hampton Court Conference, had a not dissimilar bearing. After the use of the prayer book had been absolutely prohibited by law under the Commonwealth, and restored with the monarchy, the question of revision came up once more and was discussed in the lengthy sittings of the Savoy Conference; but the numerous changes that were made in 1662, when the English book practically assumed its final form, were not of a nature to conciliate the defeated Puritans, as was shown by the fact that 2000 left their churches rather than use it. An attempt to reopen the matter with this end in view was made in 1689, after the Revolution, but nothing came of it except the report of a commission. In Scotland the Episcopal church uses the English book, with the exception of a permissive use, under certain circumstances, of a different communion office, based upon Laud's proposed book for Scotland. The disestablished Church of Ireland made a thorough revision in 1878, in a more strongly Protestant sense than any other of the current books.

The history of the American Book of Common Prayer has distinct and interesting features of its own. When the separate Episcopal church in the United States was organized, a book was compiled in 1783, now known as the Proposed Book, which had only a qualified and informal acceptance. The book actually adopted by the General Convention of 1789 disclaims in its preface the intention of departing from the Church of England in any essential point of doctrine, discipline, or worship. Its variations, accordingly, are chiefly those required by local circumstances or made for the purpose of removing archaisms in the language, though more important changes are the omission of the Athanasian Creed, the option of omitting the use of the cross in baptism and of the words "he descended into hell," in the Creed, and the addition of certain prayers. The influence of the Scottish bishops from whom Seabury obtained his consecration was felt in the restoration, following their own use, of the invocation of the Holy Ghost in the central prayer of the eucharistic office, after primitive models. Minute, careful, and deliberate processes of revision, lasting over nine years, resulted in the publication in 1892 of a prayer book which probably will remain materially unchanged for many a year.

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PRAYER FOR THE DEAD. The practice which prevails in the Roman Catholic, Greek, and other Oriental churches of praying for the souls of the deceased with the intention and expectation of obtaining for them an alleviation of their sufferings after death, because of venial sins, or of the penalty of mortal sins, remitted but not fully atoned for during life. A belief in the efficacy of sacrifice and prayer for the dead existed in many of the ancient religions, especially those of Egypt, India, and China. The existence of this belief, implicit, if not explicit, affords the only rational explanation of many of the practices of the Greeks and Latins with regard to their dead. In primitive religions it is often difficult to distinguish between sacrifice to the dead and sacrifice for the dead. Among the Jews the custom of prayer for the dead is attested by the well-known text in 2 Maccabees xii. 44, 45, that it is "a holy and wholesome thought to pray for the dead that they may be loosed from their sins." The practice of prayer for the dead is equally recognizable in the early Christian Church. The parable of Lazarus and the rich man evidently portrays a definite belief in the intercommunion of this earth with the world beyond the grave. The fathers of the first centuries frequently allude to prayers for the dead as a common and unquestioned practice. The liturgies of all the rites without exception contain such prayers. Prayer for the dead has been a constant tradition of the Roman Catholic and Eastern churches. The development of the doctrine of purgatory fixed more firmly the custom of prayers and masses for the dead. The Protestant churches, repudiating the doctrine of purgatory, repudiated also prayers for the dead. The English church does not expressly forbid the practice, though prayers for the dead are eliminated from the prayer book, and there is an almost unbroken tradition of ecclesiastical authorities, including such names as Andrewes, Barrow, Ken, Wesley, and Keble, who approved of it.

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PRAYER OF JOSEPH. See Joseph, Prayer of.

PRAYER OF MANASSEH. See Manasseh, Prayer of.

PRAYING INSECT, or Mantis. See Mantis.

PREACHING FRIARS. See Dominicans.

PREADAMITES. Supposed inhabitants of the earth anterior to Adam. The term is applied particularly to a theory advanced by Isaac de la Peyrère (better known by his Latinized name Pererius), which he attempted to prove from the Bible. Peyrère was born of a Calvinist family of Bordeaux in 1594, and was attached to the service of the Prince of Condé. His theory was first made public in Paris in 1655 in the form of a commentary on Rom. v. 12–14 entitled *præadamitæ*. The same year he published the first part of a formal treatise on the preadamite hypothesis and the theological consequences to be derived therefrom, entitled *Systema Theologicum ex Præadamitarum Hypothesi.* According to his hypothesis Adam was the progenitor of the Jewish race only, and it is only of him and his race that the Bible is designed to supply the history. Other races existed on earth before that of Adam; but of them the Bible contains no record, nor did the Mosaic law regard them or impose any obligation upon them. It was only under the gospel that they began to be comprehended in the law, which through Christ was given to all the human races of the earth.

As his book was published in the Low Countries, he fell under the animadversion of the Inquisition, and eventually was arrested in the diocese of Mechlin, but was released at the instance of the Prince of Condé. He afterward went to Rome, where he conformed to the Roman Catholic church and made a full retraction of his erroneous opinions (*Epistola ad Philotimum,* Rome, 1657). He was offered preferment by the Pope, Alexander VII, but returned in preference to Paris, where he entered the Seminary of Notre Dame des Vertus, in which he resided till his death in 1676. For a modern discussion of this theme, consult Winchell, *Preadamites* (Boston, 1880).

PRÉ AUX CLERCS, prȧ ō klârk, Le. A large plain once extending to the gates of Paris, northeast of the abbey of St. Germain des Prés, on the left bank of the Seine, so called because in the Middle Ages it was a resort of the students of the university. The part owned by the abbey attracted students by being nearer, and riots with the monks resulted in legislation by which it was ceded to the university in 1368. Later it was a resort of fashion and of duelists. It is now covered by the Faubourg Saint-Germain.

PREB'END (ML. *præbenda,* prebend, allowance of food and drink, fem. sing. or neut. pl. of Lat. *præbendus,* gerundive of *præbere, præhibere,* to offer, from *præ,* before + *habere,* to have). Originally, a portion of food, clothing, or money allowed to a monk or other cleric out of the revenues of a cathedral or collegiate church. After the organization of chapters of canons, endowments came to be made for their support, the canons usually living in common. When, about the eleventh century, canons ceased to live in common, each received a share of the revenues of the cathedral, called a prebend. At the present time in the Church of England all prebendaries in residence are by law styled canons, but the holders of disendowed prebendal stalls are still known as prebendaries.

PREBLE, prĕb'l, Edward (1761–1807). An American naval officer. He was born in Portland, Me., ran away from home in 1777, joined a privateer, and soon afterward entered the Massachusetts marine as a midshipman on the *Protector.* In 1779 he was captured and imprisoned on the prison ship *Jersey* in New York harbor, but was soon released, and until the close of the war served on the *Winthrop.* While attached to this vessel, with only 14 men he boarded a British brig in Penobscot Bay, Maine, and took her out in the face of a battery. When the United States navy was organized, in 1798, he was one of the first to be commissioned as lieutenant, and in 1799 was promoted captain. In the same year, while in command of the *Essex,* he convoyed from Batavia a fleet of merchant vessels. In May, 1803, he was put in command of the squadron fitted out against the Barbary Powers. Arriving off Tangiers in October, he forced the Sultan of Morocco to renew the Treaty of 1786 (see Barbary Powers, Wars with the), and then cruised for some time in the vicinity of Tripoli, which port he kept closely blockaded for several months. On July 25, 1804, his fleet then consisting of a frigate, three brigs, three schooners, two bomb vessels, and six gunboats, he attacked the defenses of Tripoli and the Tripolitan fleet with great vigor, captured three gunboats, and sank three more. Five subsequent attacks did considerable damage. However, in September of the same year he was superseded in his command by Commodore Samuel Barron. Preble received a medal and a vote of thanks from Congress, and in 1806 was urged by President Jefferson to enter the cabinet as Secretary of the Navy, but declined on account of failing health. In 1807 he died of tuberculosis at Portland.

PREBLE, George Henry (1816–85). An American naval officer, born at Portland, Me., a nephew of Edward Preble. He entered the United States navy as a midshipman in 1835, and during the war with Mexico participated in the operations along the Gulf coast of that country. In 1853 he was assigned to the *Macedonian,* accompanying Commodore Perry to Japan. While in the Far East he was sent on an expedition to punish Chinese pirates. During the early part of 1862 he commanded the gunboat *Katahdin* and participated in Farragut's operations against New Orleans. He was promoted commander in July, 1862, and while he was commanding the *Oneida* off Mobile his blockade was broken by the Confederate cruiser *Oreto* or *Florida.* For this he was dismissed from the service, until it was learned that the *Florida* owed her escape solely to superior speed. Preble was then reinstated. In 1864 he was in command of the fleet brigade which coöperated with General Sherman's army. Later he was chief of staff of the North Pacific squadron (1868–70), commandant of the Philadelphia Navy Yard (1873–75), and commanding officer of the South Pacific station (1877–78). In 1876 he was promoted rear admiral, and in 1878 retired. He published *A History of the Flag of the United States, etc.* (1880) and *A Chronological History of the Origin and Development of Steam Navigation* (1883).

PRE-CAMBRIAN FORMATIONS. A term usually applied to all formations which are older than those containing the *Olenellus* fauna of the Cambrian period. The reason for applying so general a name to this series of rocks is that the Pre-Cambrian strata are often so highly metamorphosed and devoid of organic remains that their stratigraphic relations are indistinct, and it is therefore impossible to assign them an exact position in the geologic scale.

The Pre-Cambrian rocks consist in general of: (1) a great series of more or less highly metamorphosed igneous and sedimentary strata, such as gneisses, schists, slates, quartzites, crystalline limestones, etc.; (2) igneous rocks but slightly altered; (3) recognizable sedimentary rocks, which in rare cases contain fossils. In addition to the intense metamorphism which some of these rocks have undergone, they are often interfolded and much broken by faults. The mere fact that rocks are highly metamorphosed, however, does not determine them to be of Pre-Cambrian age, for such changes have sometimes taken place in rocks of much later date, as in the Devonian and Carboniferous.

The length of time occupied by the Pre-Cambrian periods must always be largely a matter of speculation, but geologically it extended from the time of formation of a solid crust up to the beginning of the Cambrian. Judging from the variety of forms that are found developed in as early a period as the Cambrian, and the length of time that has been required to develop the present fauna and flora found on the earth, the length of Pre-Cambrian time must have undoubtedly been very great. The highly altered character of the Pre-Cambrian rocks has unfortunately obliterated many fossil remains that were buried in the sedimentary strata, and as a rule it is only in the younger members of the series that distinct fossils have been found.

The classification of the Pre-Cambrian rocks is attended with great difficulty, and no single system has as yet been adopted by the geologists of different countries. In the United States and in Canada the formations are usually divided into a lower system called the Archean and an upper system termed the Algonkian. The former is sometimes also termed the basement or fundamental complex, and consists of igneous and highly metamorphosed rocks, so altered that their original condition is a matter of great uncertainty. Under the Algonkian are included the younger Pre-Cambrian rocks, which can usually be identified as sedimentary, although igneous intrusions of large extent also took place in this period. An earlier classification grouped all the Pre-Cambrian rocks as Archean, subdividing them into a lower series called the Laurentian and an upper series, the Huronian, which corresponds in general to the present Algonkian.

The Pre-Cambrian rocks are widely distributed over the earth, but by no means in a uniform manner. They usually occur in disconnected areas, which are especially developed along the axes of mountain ranges, and also in larger unbroken masses that may cover many thousands of square miles. They constitute the base upon which the Cambrian and later strata have been deposited. Their exposure at the surface may be due to their having remained uncovered since early geologic times or because the overlying sediments and other rocks of later date have been worn away. The more important Pre-Cambrian areas found in North America are the following: 1. Laurentian area of Canada, consisting of a basement complex or Archean system known as the Ottawa gneiss, which grades up into the Grenville series of Algonkian age. 2. The Hastings district southwest of Ottawa. 3. The original Huronian area bordering the north channel of Lake Huron and extending west to Lake Superior. Both the Archean and Algonkian are recognizable here, the latter being subdivided into an upper and a lower Huronian. 4. Adirondack area of eastern New York. 5. The Lake Superior region. Probably a greater amount of work has been done in this area than in any other of Pre-Cambrian age, and the stratigraphic details have been most carefully worked out. 6. Eastern United States, a belt extending from Maine through New Hampshire, Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, Maryland, Georgia, North Carolina to Alabama, and consisting of a complex series of semicrystalline and holocrystalline rocks. 7. Black Hills area. 8. Southeast Missouri area. 9. Central Texas. 10. Scattered areas in the Cordilleran region. Pre-Cambrian rocks are known also in Great Britain, Scandinavia, central Europe, China, India, and Australasia.

The Pre-Cambrian rocks are rich in ores and mineral materials. Almost inexhaustible supplies of iron ore are found in the Lake Superior region, constituting the largest iron-mining district in the United States, and important deposits of the same metal are known in the Pre-Cambrian gneisses and schists of New York and New Jersey. Many valuable quarries of building stone, especially granite and marble, are located within the Pre-Cambrian areas, while the other economic minerals include graphite, garnet, apatite, talc, emery, feldspar, gold, copper, and nickel.

Bibliography. C. R. Van Hise, "Correlation Papers, Archæan and Algonkian," *United States Geological Survey, Bulletin No. 86* (Washington, 1892); Adams, "On the Typical Laurentian Area of Canada," in *Journal of Geology* (Chicago, 1893); Van Hise, "Principles of Pre-Cambrian North American Geology," *Sixteenth Annual Report United States Geological Survey* (Washington, 1896); Kemp, "Pre-Cambrian Sediments in the Adirondacks," in *Science*, vol. xii (New York, 1900); C. R. Van Hise, "The Iron Ore Deposits of the Lake Superior Region," *Twenty-first Annual Report United States Geological Survey* (Washington, 1901); Archibald Geikie, *Text-Book of Geology* (4th ed., 2 vols., New York, 1903); Van Hise and Leith, "The Geology of the Lake Superior Region," in *United States Geological Survey, Monograph LII* (Washington, 1912); see also papers in *Compte-Rendu du Congrès Geologique International*, eleventh and twelfth sessions (Stockholm, 1912; Ottawa, 1913). See ALGONKIAN SYSTEM; ARCHEAN SYSTEM; LAURENTIAN SYSTEM; ETC.

PRECE′DENCE (ML. *præcedentia*, from Lat. *præcedere*, to go before, from *præ*, before + *cedere*, to go, yield; connected with *cadere*, Skt. *śad*, to fall). The order in which individuals are entitled to follow one another in a state procession or on other public occasions. In former days questions of this sort were considered of great importance; thus, the memoirs of Saint-Simon are largely occupied with minute histories of acrid controversies on these points. In modern times, with the gradual diminution of court ceremonial, less interest attaches to them; but they are still minutely regulated in some countries, either by statute law, by royal letters patent, or by ancient usage. The order of precedence among different countries is in modern practice reduced, as in the signing of treaties by several powers, to the alphabetical order of their names. Precedence among the diplomatic representatives accredited to any government depends upon the date of the presentation of their credentials, ambassadors, however, ranking envoys and ministers plenipotentiary. Precedence involves the right to be presented, or to pass into a room, first or before another; but in processions, especially those of ecclesiastical dignitaries, the persons of highest rank regularly come last.

In the United States the only positive precedence is that given by official position, and in the settling of uncertain questions arising under this system there is no final authority, different administrations having acted in different ways. The most generally accepted order of official precedence at the national capital is as follows:

The President; the Vice President and President of the Senate; ambassadors in their order; the Chief Justice of the United States; Senators; the Speaker of the House; Representatives in Congress; associate justices of the Supreme Court; the Secretary of State, members of the Diplomatic Corps other than ambassadors, and foreign members of international commissions; the Secretary of the Treasury; the Secretary of War; the Attorney-General; the Postmaster-General; the Secretary of the Navy; the Secretary of the Interior; the Secretary of Agriculture; the Secretary of Commerce and Labor; the general of the army and the admiral of the navy; the governors of States; the Chief Justice and associates of the Court of Claims; circuit and district judges of the United States; the justices and associates of Territories and District of Columbia; the lieutenant general and the vice admiral; diplomatic representatives of the United States; major generals, rear admirals, and staff officers of equal rank; brigadier generals and commodores; chiefs of quasi-independent civil bureaus; chiefs of departmental bureaus in the order of their chief officers; colonels, captains of the navy, staff officers of equal rank, the colonel of the marine corps; consuls general and consuls of foreign governments, according to date of exequatur, and the same of the United States, according to seniority of service; lieutenant colonels and majors of the army, commanders and lieutenant commanders of the navy, and staff officers of equal rank; the commissioners of the District of Columbia, governors of Territories, lieutenant governors, and other elective State officers in their accepted order at home; captains, first lieutenants and second lieutenants of the army, lieutenants, masters, and ensigns of the navy, and staff officers of equal rank; assistant secretaries of executive departments, secretaries of legations, secretaries of the Senate and House of Representatives; and the clerk of the Supreme Court.

For the full table of precedence in England, consult any peerage; for that of Germany, Stillfried, *Ceremonialbuch des preussischen Hofs* (Berlin, 1878); for the older continental usage, Hellbach, *Handbuch des Rangrechts* (Ansbach, 1804). Articles on precedence will be found in encyclopædias of various countries, often with royal or official orders regarding it.

PREC′EDENT (from Lat. *præcedens*, pres. p. of *prædere*, to go before). In a general sense, any act or determination which is taken as a guide to action under similar circumstances thereafter.

In its technical legal sense the term "precedent" has come to be employed to designate (*a*) the settled practice of the bar and (*b*) the judicial determination of questions of law by the courts. The popular expression "forms and precedents" points to the former use of the word, as in the forms of pleading and the forms employed in conveyancing, which have acquired commanding authority in the legal profession and are implicitly followed by successive generations of lawyers, until changed by statutory authority, only because of a long-continued exact observance.

Of a different character is the judicial precedent. This has intrinsic authority and exerts a more or less binding force from the hour of its promulgation. It is not peculiar to the common-law system of England and the United States, but is in some degree essential to the administration of every legal system. Indeed, it is involved in the very conception of law as a rule of conduct that the same acts shall produce the same legal consequences, that the same combination of circumstances, however often it may arise, shall invariably be dealt with in the same way.

In this respect, however, there is considerable difference between the system of the United States and the civil-law system on the continent of Europe. While it is undoubtedly the practice for a court in France or Germany, e.g., to follow a rule which has been frequently and consistently followed as law by the superior courts of the jurisdiction, it is now generally conceded that judicial usage, as such, has formally no binding force and materially only so much value as belongs to it as a sound exposition of legal principle, while in England and the United States such usage is of controlling authority.

Consult: Sir Frederick Pollock, *Essays in Jurisprudence and Ethics* (London, 1882); John Austin, *Jurisprudence* (5th ed., ib., 1885); Sir William Blackstone, *Commentaries* (4th ed., 2 vols., Chicago, 1899); Brown, *The Austinian Theory of Law* (London, 1906); J. C. Carter, *Law: Its Origin, Growth, and Function* (New York, 1907); J. C. Gray, *Nature and Sources of the Law* (ib., 1909). See DICTUM; LAW; STARE DECISIS.

PRECEN′TOR (Lat. *præcentor*, leader in music, from *præcinere*, to sing before, from *præ*, before + *canere*, to sing). The official in a chapter, whether cathedral or collegiate, whose duty it was to lead the singing. He began the psalm or hymn, which was taken up and repeated either by the celebrant or another of the body or by the rest of the choir. In modern chapters the precentor ranks next in dignity to the provost or dean. He usually has charge of training the choir and of the selection of the music. Among the nonepiscopal bodies the precentor is the person who begins and conducts the singing, and who usually stands in front of the pulpit, sometimes at one side of it.

PRECEPT (Lat. *præceptum*, rule, doctrine, maxim, precept, neut. sing. of *præceptus*, p.p. of *præcipere*, to instruct, admonish, take beforehand, from *præ*, before + *capere*, to take). In law, a command or mandate in writing, directed to a sheriff or other ministerial officer and constituting his authority to do the act named therein. It is generally considered as synonymous with the word "process."

PRECEPTORS, COLLEGE OF, LONDON. An educational institution established in 1846 and incorporated by Royal Charter in 1849 for the purpose of promoting the interests of education, especially among the middle classes, mainly through the training of teachers. From its initiation the advancement of the education of girls and the training of schoolmistresses and governesses were accepted as among the important duties of the college. The influence of the college has always been exercised through the conduct of examinations of secondary-school pupils and of teachers. In 1867 the first examination in the theory and practice of education was held; in 1871 a successful series of lectures in education was carried out and was followed in 1872 by the establishment of the first chair in education in England, held by Joseph Payne. The college also conducts winter meetings, and offers short courses in education for teachers. The system of examination of secondary schools, begun in 1853, has exercised an important influence, in the absence of centralized control, both in coördinating the work of these schools and in setting up standards for teachers. At a time when the English secondary schools paid little attention to any subject outside the classics, the college performed the valuable service of promoting the study of mathematics and science.

The college has about 1000 active members, divided into the ranks of fellows, licentiates, and associates, according to the examination passed. There are, in addition, about 4500 persons holding these ranks who are not members of the college. A valuable educational library, a common room, and offices are maintained in London, and the *Educational Times* is published monthly as the organ of the institution. Consult the annual *Calendar*.

PRECEP′TORY (ML. *præceptorius*, relating to instruction, from Lat. *præceptor*, instructor, from *præcipere*, to instruct, admonish, take beforehand). The name given to provincial communities of the Knights Templars, the superiors of which were called knights preceptors. All the preceptories of a province were subject to a provincial superior, called grand preceptor; and there were three of these who held rank above all the rest, the grand preceptors of Jerusalem, Tripolis, and Antioch. Such communities among the Hospitallers were known as commanderies. See Templars.

PRECES′SION (ML. *præcessio*, advance, precedence, from Lat. *præcedere*, to go before). The points in which the equator intersects the ecliptic, called the equinoctial points, do not remain stationary, but retrograde slowly, i.e., move from east to west. This motion is called the precession of the equinoxes (q.v.). The word "precession" is used because if on one day one of the equinoctial points arrive at the meridian of a place simultaneously with a fixed star, it will next day arrive at the meridian sooner than the star, or will precede it in transit. The amount of this movement is about 50″ each year, and the equinoctial points will therefore require 25,800 years to make a complete circuit in the heavens. This movement of the equinoxes explains also the want of coincidence between the signs of the zodiac and those of the ecliptic. See Aries.

If the earth were truly spherical and homogeneous, or, more generally, if it were such that the resultant of the gravitational attractions exerted on all its parts by any other body always passed through a single definite point in its mass, its diurnal rotation would not be affected by the attractions of any other bodies. If originally rotating about a principal axis of inertia, it would forever revolve about it, and the direction of the axis would remain fixed in space. To put this in more popular language, the polestar (q.v.) would always be the same star. But, although the earth rotates about an axis almost exactly coinciding with its axis of figure, the attraction of various bodies, especially the sun and the moon, on the oblate protuberant portion at the equator tends to give it a rotation about an axis in the plane of the equator, and the combination of these two rotations gives rise to a shifting of the instantaneous axis of rotation in the earth and also in space. If this attracting force were constant, the pole of the equator would revolve about the pole of the ecliptic in a circle and the equinoxes would move along the ecliptic at a constant rate. But, owing to the disturbance called nutation (q.v.), produced by the varying attraction of the sun, and particularly of the moon, the motion of the pole is waved and not exactly circular, and consequently a slight periodic variation is produced in the mean rate of precession. This gives rise to a small displacement of the mean position of the equinox, amounting to a few seconds only, and known as the equation of the equinox. See Lunar Theory.

PRECHTL, prĕk′t'l, Johann Joseph von (1778–1854). An Austrian physicist, born in Bischofsheim and educated at Würzburg. He settled in Vienna in 1802 and in 1815 became director of the Institute of Technology there. He founded in 1809 the Naval Academy at Triest. Prechtl wrote many articles for the *Technologische Encyklopädie* (1830–55), of which he was editor, and for the *Jahrbücher des Polytechnischen Instituts* (1819–39), which also was under his editorial charge, and published: *Grundlehren der Chemie in technischer Beziehung* (1814–15; 2d ed., 1817–18); *Praktische Dioptrik* (1828); *Untersuchungen über den Flug der Vögel* (1846).

PRÉCIEUSES RIDICULES, prå′syẽs′ rė̄′dė̄′kụl′, Les (Fr., the ridiculous bluestockings). A brilliant comedy by Molière, first produced on Nov. 18, 1659, in the Hôtel du Petit-Bourbon in Paris, and acted in 1660 before the King, who presented 3000 livres to the actors. The success of the play was due to Molière's scathing and brilliant satire of the *esprit précieux* developed in the Hôtel de Rambouillet and exhibited in its most exaggerated form by Mademoiselle de Scudéry and her school.

PRÉCIEUX, prå′syẽ′ (Fr., finical, affected). An epithet applied to the affected style which developed in France during the seventeenth century. It was the outcome of a movement for purity and refinement in language, fostered in various Parisian salons, notably in that of the Hôtel de Rambouillet. Under its influence fantastic turns of speech replaced simple expressions to such a degree that the whole movement acquired a ridiculous character and led Molière to write his brilliant satire *Les précieuses ridicules*, which gave the deathblow to the school. See Rambouillet, Hôtel de.

PRECIOUS METALS. As the predominant use of the precious metals is for monetary purposes and radical changes in the quantity of the metals affect all prices, much interest attaches to their production. From the collapse of the

AVERAGE ANNUAL PRODUCTION IN FINE OUNCES

	Gold	Silver
1493–1520	186,470	1,511,050
1521–1600	238,071	8,660,207
1601–1700	293,304	11,970,731
1701–1800	610,882	18,336,720
1801–1840	512,214	20,028,887
1841–1850	1,760,502	25,090,342
1851–1860	6,508,293	28,792,113
1861–1870	6,082,534	39,226,778
1871–1880	5,567,062	71,046,308
1881–1890	5,073,250	102,053,872
1891–1895	7,882,564	157,581,331
1896–1900	12,461,478	165,390,822
1901–1905	15,606,730	167,995,408
1910	22,022,180	221,715,673
1912	22,549,335	224,310,654
Total production 1493–1912	714,747,822	11,083,136,909

Roman Empire to the discovery of America it is probable that no important additions were made to the world's monetary stock. With the discovery of America a new era came in, but it was not before the conquest of Mexico (1521) and of Peru (1533) that appreciable additions were made to the world's stock of silver and gold. The course of gold and silver production since 1493 is given in the table on page 167. Consult E. A. Smith, *Sampling and Assay of the Precious Metals* (Philadelphia, 1914). See GOLD; SILVER.

PRECOCITY, prė-kŏs′ĭ-tĭ (from Lat. *præcox*, ripened too soon, from *præcoquere*, ripen beforehand, from *præ*, before + *coquere*, to cook; connected with Gk. *πέπτειν*, *peptein*, Skt. *pac*, to cook). Supernormal early development, especially of the mental functions. The chief problems of precocity are (1) the relation between mental precocity and bodily abnormalities, (2) the relation between precocity and genius, (3) the course of training that the precocious child should receive. It is popularly supposed that precocious children are particularly subject to nervous and certain other diseases and to arrest of physical growth, so that they are in danger of mental stagnation or degeneration. Statistical studies tend to show, however, that early manifestation of genius is not incompatible with prolonged development. Donaldson, e.g., calculates that of 287 geniuses in various fields 80 per cent gave distinct signs of promise before 20, 80 per cent produced work before 30, 84 per cent attained fame before 40. Musical talent is especially likely to be precocious; only 6 per cent of the great composers failed to show marked ability as children.

Two forms of mental precocity should be distinguished, viz., superiority of general intelligence and superiority of special capacity, or talent. As regards training it is generally agreed that precocious children, especially those of the latter type, should receive physical attention and that their bent should be allowed neither to incite to overstrain nor to result in mere virtuosity. With recent advances in the treatment of subnormality there has come a growing recognition of the need for similar study and training of supernormality in both its forms.

Consult: Francis Galton, *Hereditary Genius* (London, 1892); H. H. Donaldson, *Growth of the Brain* (ib., 1895); A. Lang, "Genius in Children," in *North American Review*, clxiv (New York, 1897); A. F. Chamberlain, *The Child: A Study in the Evolution of Man* (ib., 1900); H. H. Ellis, *Man and Woman*, in "Contemporary Science Series" (4th ed., ib., 1911); W. Stern, "The Supernormal Child," in *Journal of Educational Psychology*, ii (Baltimore, 1911).

PRECOGNITION, prē′kŏg-nĭsh′ŭn (Lat. *præcognitio*, foreknowledge, from *præcognoscere*, to know beforehand, from *præ*, before + *cognoscere*, to know). In Scots law, an examination before a judge ordinary or justice of the peace, corresponding in the United States (1) to a preliminary examination before a magistrate of a person accused of a criminal offense and (2) to the taking of depositions. In Scottish practice the term is also applied to an examination of witnesses by a solicitor before the trial of a civil cause, at which time it is customary for him to write down the substance of their testimony, the writing itself being sometimes called a precognition.

PREDEL′LA. The step or ledge on the rear edge of an altar table, upon which stands the altarpiece (see ALTAR) or the cross and candlesticks; hence by extension the painting or other decoration upon the front of the step. Some of these paintings are works of exquisite art, e.g., that by Fra Angelico in the Louvre. By a further extension the term is sometimes incorrectly applied to the entire altarpiece with the altar step on which it stands.

PREDENTATA. See DINOSAURIA.

PREDES′TINA′TION (Lat. *prædestinatio*, from *prædestinare*, to determine beforehand, from *præ*, before + *destinare*, to determine). A theological term signifying (1) generally, God's predetermination of the events of the world, (2) specifically, the eternal decree of God whereby certain men are appointed unto salvation. The opposite decree is called that of reprobation. The two ideas of an eternal God who works by plan in governing the world and of such a sinful condition among men that no one could be saved without the operation of God, logically lead to the idea of predestination. This connection of thought is found in St. Paul, was elaborated by Augustine, and was established in the Reformed theology by Calvin, forming a central conception in the Augustinian and Calvinistic systems. The term, by its connection with the word "destiny," conveys an unfortunate implication, as if predestination had to do with fate. Theologians have usually, however, maintained that predestination did not destroy the freedom of the will. With Augustine predestination is an affair of grace, and concerns chiefly what God will Himself do, the persuasives He will employ to elicit the good choice of the will. He made no attempt to exhibit the reasons why some are brought to faith and salvation and others not. It was a matter of the inscrutable wisdom and mercy of God. In this reticence he has been imitated by most of his followers. Negatively, Calvin and the Reformed theology emphasized with great force the position that the predestination of God did not depend upon the divine foreknowledge of faith which would be exercised by the elected individual, for that faith, as the entrance into the kingdom of God and the condition of salvation, is the result of the election. They did not, however, exclude all foreknowledge of the individual. The Arminians were sometimes thought to condition predestination upon foreknowledge of faith, but no creed states this (except certain creeds of the Greek church). The main contention of Augustine, that salvation begins in the initiative of God, is generally accepted by evangelical Christians; but the adjustment of this position to human freedom is a point in reference to which much diversity prevails. In recent times the drift of opinion has been against efforts to make such an adjustment, and the current of discussion has carried theological interests into other departments of thought. Present tendencies are to emphasize the known, the facts of human religious experience, and avoid inferences of a precarious nature as to the unknown. Consult the treatises on systematic theology, particularly Charles Hodge (3 vols., New York, 1871–72); J. B. Mozley, *A Treatise on the Augustinian Doctrine of Predestination* (2d ed., London, 1878); J. Forbes, *Predestination and Free Will* (Edinburgh, 1879); Dodge, *The Purpose of God* (Boston, 1894); M. Scheibe, *Calvin's Prädestinationslehre* (Halle, 1897); H.

von Schubert, *Die sogenannte Prädestinatus* (Leipzig, 1903). See ARMINIANISM; AUGUSTINE, SAINT; CALVINISM; ELECTION; FREE WILL; PELAGIANISM.

PRED′ICABLE (Lat. *prædicabilis*, what may be spoken of, from *prædicare*, to declare, from *præ*, before + *dicare*, frequentative of *dicere*, to say). A term in the scholastic logic connected with the scheme of classification. There were five designations employed in classifying objects on a systematic plan—genus, species, difference (*differentia*), property (*proprium*), and accident (*accidens*). Genus is the name of any class—marked off by some attribute or attributes, called generic—subdivided into further classes, which are called the species of the genus. The other three designations—difference, property, accident—are names given to attributes, other than the generic, possessed by objects classified. The difference, or more frequently the specific difference, is what distinguishes species of the same genus. Property designates any mark peculiar to a class but not used as a basis of classification. The accident is any feature which is neither a generic attribute, a specific difference, nor a property. There is much confusion of thought and conflict of usage in connection with the terms "property" and "accident." Consult the logical works mentioned under LOGIC.

PREDICAMENT, IN LOGIC. The Latin translation of the Greek term for "category" (q.v.).

PRED′ICATE. See JUDGMENT.

PREDIS, prā′dēs, AMBROGIO DE (c.1455–c.1515). A Milanese painter of the Renaissance. He was educated in the school of Foppa, and afterwards became a follower of Leonardo to the extent that their works were confounded for many years. "The Virgin of the Rocks," in the National Gallery, London, is now generally conceded to be a copy by De Predis of Leonardo's original in the Louvre. He was the favorite painter of Ludovico Sforza, "the Moor," and probably went to Innsbruck in 1499 with the duke and his family. The portrait by him of the Emperor Maximilian (1502), who married Bianca Sforza, is in the Vienna Gallery; that of a young woman thought to be Bianca herself, and formerly attributed to Leonardo, is in the Ambrosiana, Milan. It is a masterpiece, but the real portrait of Bianca is in the Widener collection, Philadelphia. De Predis was rescued from oblivion by Giovanni Morelli, the art critic. Among the portraits now generally attributed to him are "The Musician," in the Ambrosiana, and Francesco Brivio, in the Poldi-Pezzoli collection, Milan—both fine examples. Portraits of unknown personages by him, usually bust or profile, are in the Bergamo Gallery (two), Weber collection, Hamburg, Hanover Museum (two), National Gallery, London, Frizzoni collection, Milan, Winthrop collection, New York, and elsewhere. Interesting miniatures by him are in the British Museum and the Trivulzio collection, Milan. Despite certain defects of drawing De Predis is one of the most interesting painters of the Milanese school. Consult Morelli, *Italian Painters* (London, 1892).

PREECE, SIR WILLIAM HENRY (1834–1913). A British electrical engineer, born in Carnarvon, Wales, and educated at King's College School, London. He held important positions at various times with the Electric and International Telegraph Company, the London and Southwestern Railway, the Channel Islands Telegraph Company, and the Post Office Department, of which he was engineer in chief from 1892 to 1899. In the latter year he was knighted. Preece did valuable pioneer work in railway signaling and, more especially, in wireless telegraphy and telephony, and he was an excellent popular lecturer. He revised Goodeve's *Telegraphy* (1876, with Sir James Sivewright; 18th ed., 1905; revised by his son, W. L. Preece, 1914); and Noad's *Student's Text-Book of Electricity* (1879); and wrote, with the Count du Moncel, *Incandescent Electric Lights* (1882), with Julius Maier, *The Telephone* (1889; Ger. version, 1889; Fr., 1890), and, with A. J. Stubbs, *A Manual of Telephony* (1893).

PREËMP′TION (ML. *præemptio*, a buying before, from Lat. *præ*, before + *emptio*, purchase, from *emere*, to buy). In international law, the right of a belligerent power to seize provisions and other articles belonging to the citizens of a neutral state while such goods are in transit to an enemy port, as being probable contraband of war, and for which proper compensation or indemnity is made to the owners. The English rule is to pay the market value of the goods seized, together with a reasonable probable profit, usually estimated at 10 per cent on that amount. By the treaty of Nov. 19, 1794, between the United States and Great Britain, certain articles, as munitions of war and naval stores, were classed as absolute contraband of war and subject to confiscation, and it was further stipulated that all other articles seized as contraband of war should be bought at a reasonable price and the owner indemnified for all damages sustained thereby. Compensation is often made as a matter of grace or of policy where the capture, though sustained by the captor's prize courts, is of doubtful legality or where its legality is strongly disputed by the government of the neutral shipper. Great Britain applied this principle on a large scale in connection with its blockade of German and neutral European ports in 1915. See CONTRABAND OF WAR; INTERNATIONAL LAW; and consult the authorities mentioned under the latter title.

In English law the term preëmption is employed to denote a contract right to buy real property, in event of a sale, at a price equal to or greater than the highest price offered by any other person to the owner within the stipulated time. In the United States this sort of right is commonly included under the phrase "option to purchase."

Preëmption Right. A right formerly given to citizens of the United States under the public land laws to buy a quarter section of public lands at a limited price in preference to all other persons, provided they complied with certain regulations. The preëmption laws were repealed by Act of Congress, March 3, 1891 (26 U. S. Stat. at Large, p. 1097), but the rights of those who had previously filed their claims were saved. This means of acquiring public land differed from that provided by the homestead laws, which require occupation and cultivation. See HOMESTEAD LAWS; LANDS, PUBLIC.

PREËSTABLISHED HARMONY, THE DOCTRINE OF. The theory propounded by Leibnitz to account for the agreement between the changes which take place in the various monads constituting the universe. Each monad (q.v.) develops its own life in causal independence of its environment, by virtue of its own intrinsic nature; but there is a logical interrelation between all constituents in a systematic whole. From all possible systems God chose the one which is our universe and gave it reality. In doing this He once for all gave reality to the harmony between the different elements in the system in their progressive development. This view differs from occasionalism (q.v.), propounded by Geulincx, in that the latter holds that correspondence is produced by God at the particular time, while according to the doctrine of preëstablished harmony the correspondence has been previously ordained, and leaves no necessity for the perpetual intervention of God. The term "doctrine of preëstablished harmony" is used also for any view which holds that the order of the universe is not one of continuous dynamic interrelation, but was imposed once for all at the very beginning. This generalized use of the term thus does not presuppose Leibnitz's monadism. See Continuity, Law of; Leibnitz; Optimism.

PREËXISTENCE, Doctrine of. The belief that human souls were in existence before the generation of the bodies with which they are united in this world. The idea has always been widely spread throughout the East. The Greek philosophers too, especially those who held the doctrine of transmigration, as the Pythagoreans, Empedocles, and Plato, were familiar with the conception. With some of the early Christians, as Origen, the assumption of such preëxistence was connected with the belief that God had created the souls of men before the world and that these were united with human bodies at generations or at birth. Subsequently the followers of this opinion were termed preexistencists, to distinguish them from the traducianists, who held that children received soul as well as body from their parents. Consult Julius Müller, *Die christliche Lehre von der Sünde* (Breslau, 1839; 2d ed., 1888; Eng. trans., Edinburgh, 1852–53, 1868), and G. H. Howison, *The Limits of Evolution* (2d ed., New York, 1905). See Metempsychosis.

PRE′FECT (Lat. *præfectus*, overseer, governor, from *præficere*, to set over, from *præ*, before + *facere*, to make, place). The title of many officers and magistrates in ancient Rome. The most important was the *præfectus urbi*, or city warden, an appointive office of high rank established in very early times. In the kingly period the city prefect represented the King during his absence from the city in time of war, and under the Republic he performed the same office for the consuls, being himself always an ex-consul. Later, with the establishment of the office of city prætor (see Prætor), that of city prefect lost its importance, until renewed in the reorganization of the government by Augustus. It now became an Imperial magistracy of very high importance, and, as before, only ex-consuls were eligible. The duty of the *præfectus urbi* was to maintain order in Rome; he was thus a sort of chief of police, as in France and in Italy to-day. Other prefects of high (senatorial) rank under the Empire were the *præfectus alimentorum*, in charge of the public grain supply; the *præfectus ærarii Saturni*, or head of the civil treasury; and the *præfectus ærarii militaris*, or head of the military treasury. Members of the second, or equestrian, rank (see Equestrian Order) were eligible, under the Empire, to another class of prefectures, of which the most important was the command of the Emperor's bodyguard (the prætorian guard, q.v.), with the title *præfectus prætorio*. The power of the prætorian prefect was often great enough to cause the overthrow of an emperor and dictate the choice of his successor. The *præfectus annonæ*, in charge of the free distribution of grain to the poor, and the *præfectus Ægypti*, vice regent of the Emperor in Egypt, were both men of equestrian rank, as were also the admirals stationed at the navy yards of Ravenna and Misenum (*præfecti classis*) and the captain of the city police (*præfectus vigilum*). In the army also there were prefects in charge of the camp and of the separate legions, cohorts, and *alæ*. Finally, in some towns of Italy the highest local magistrate had the title of *præfectus iure dicundo*.

PREFERENCE SHOP. See Closed Shop.

PRE′FORMA′TION (from Lat. *præformare*, to shape beforehand, from *præ*, before + *formare*, to shape, from *forma*, shape). A view originating in the seventeenth century with Malpighi and Bonnet. They assumed that the germs of all coming generations were contained in one primordial egg. According to this view all the parts and organs of the chick are present in the germ or egg, there being no differentiation, but only an unfolding of parts (*evolution*) existing, infinitesimal in size, in the egg. Haller emphatically stated that there was no such thing as the differentiation of parts, that no part of the body was made before another, but that all the organs were simultaneously created. It logically followed that the germ destined to give origin to the animal—the ovum according to ovulists, the sperm as asserted by the spermatists (q.v.)—contained within itself the germ of the next generation, that of the next after, and so on indefinitely, so that the first created male or female of each species contained within its sperms or ova the germs of all future generations, inclosed within one another, like a nest of Chinese boxes. The theory of incasement (*emboîtement*) propounded by Swammerdam in 1733 was that the form of the larva, pupa, and imago of the butterfly preëxisted in the egg and even in the ovary, and that the insects in these stages were distinct animals, contained one inside of the other. This explanation Swammerdam extended to the entire animal kingdom.

Consult, for recent statements: Delage, *La structure des protoplasma et les théories sur l'hérédité* (Paris, 1895); A. S. Packard, *Text-Book of Entomology* (New York, 1898); Parker and Haswell, *Text-Book of Zoölogy* (ib., 1910).

PREGEL, prā′gel. The principal river of East Prussia, formed by the confluence of the Ister and the Angerapp, below Insterburg (Map: Prussia, J 1). It flows in a westerly direction and enters the east end of the Frisches Haff about 5 miles below Königsberg. Its total length is about 80 miles, navigable throughout.

PREG′NANCY. See Abortion; Menstruation; Obstetrics.

PREHISTORIC MAN. See Man, Science of; Paleolithic Period.

PREHNITE, prān′ īt (named in honor of Colonel *Prehn*, who discovered it at the Cape of Good Hope in the latter part of the eighteenth century). An aluminium-calcium orthosilicate that crystallizes in the orthorhombic system. It has a vitreous lustre and is light green to white in color. It is widely distributed and occurs in eruptive rocks, usually associated with zeolites. When cut and polished it yields a gem resembling chrysoprase in color and lustre, and polished slabs have been cut from masses in China. See CHLORASTROLITE.

PREL, prĕl, KARL, BARON DU (1839–99). A German philosophic author. He was born at Landshut, studied at Munich, and, after 13 years (1859–72) in the Bavarian army, devoted himself to philosophy. His chief works are: *Oneirokritikon: Der Traum vom Standpunkte des transcendentalen Idealismus* (1868), which won him an honorary doctorate from Tübingen; *Der Kampf ums Dasein am Himmel* (1874; 3d ed., *Entwickelungsgeschichte,* 1882); *Die Mystik der alten Griechen* (1888); *Die Philosophie der Mystik* (1885; Eng. version, 1889); *Die Magie als Naturwissenschaft* (1899); *Der Tod, das Jenseits, das Leben im Jenseits* (1899; 2d ed., 1900). His selected works in 19 volumes were published at Leipzig in 1900–01.

PREL′ATE (ML. *prælatus,* prelate, Lat. *prælatus,* set before, p.p. assigned to *præferre,* to set before). A title given to certain ecclesiastics of a higher order, usually to patriarchs, metropolitans, archbishops, bishops, and in the Roman Catholic church to the heads of religious houses and certain other officials. The essential of the office is that it shall have ecclesiastical jurisdiction over other ecclesiastical offices. In the Roman Curia certain officials, although not bishops, wear the episcopal purple and are addressed as Monsignore. By the derived term "prelacy" is understood such an ecclesiastical polity as provides for a gradation of the clergy in rank, as distinguished from a system in which all the clergy are on an equality. Consult P. A. Baart, *The Roman Court* (Milwaukee, 1895), and E. L. Taunton, *The Law of the Church* (St. Louis, 1906).

PRELL, HERMANN (1854–). A German historical painter and sculptor. He was born at Leipzig and studied under Grosse in Dresden and Gussow in Berlin, then went to Italy to study fresco painting, in which branch he produced his most important works. Chief of these are: 11 mural paintings symbolizing the "Principal Epochs in the History of Architecture" (1881–82, Banquet Hall, Architects' Union, Berlin); "Justice" and "Valor" and "Henry IV Granting Privileges to Worms in 1074" (City Hall, Worms); cycles of historic episodes and allegorical scenes, respectively, in the city halls at Hildesheim (1888–91) and Danzig (1896) and over the staircase of the Breslau Museum (1894); mythological scenes and sculptures in the Albertinum (1901–05) and the Rathaus, Dresden (1908–12), and the frieze with subjects from northern mythology in the throne room of the German Embassy in Rome. Of his easel pictures the Dresden Gallery contains the "Betrayal of Christ" (1886), and the Breslau Museum a "Repose in Egypt" (1890). Prell was a member of the Academy of Berlin, where he taught in 1886–91, and of Dresden, in which he became professor; and he received the great gold medal at Berlin in 1893. He ranks as one of the foremost historical painters of modern Germany. He is especially known for his successful use of casein colors in fresco. In later life he essayed sculpture. For his biography, consult F. H. Meissner (Vienna, 1898) and A. Rosenberg (Bielefeld, 1901); for illustrations of his works, G. Galland (Charlottenburg, 1904).

PREL′LER, FRIEDRICH (the Elder) (1804–78). A German landscape painter, the principal representative of the so-called historic landscape in the nineteenth century. Born at Eisenach, April 24, 1804, he early removed to Weimar, where, through Heinrich Meyer (q.v.), who subsequently was his instructor, Goethe became interested in him. In 1821 Preller went to Dresden, where he copied Dutch and French masters in the Gallery. Returning to Weimar, he was introduced by Goethe to the Grand Duke Charles Augustus, who in 1824 took him to Antwerp. Here Preller studied at the Academy under Van Brée. With a stipend from the Grand Duke, he went to Milan and to Rome, where he came under the influence of Koch. At Naples in 1830 he first conceived the idea of his life work, the "Odyssey Landscapes," and there he also met Dr. Härtel, who commissioned him to paint seven of these subjects for his Roman house at Leipzig. Preller also received the commission to execute six "Thuringian Landscapes" with historical figures for the ducal palace at Weimar and to paint in tempera "Five Scenes from Oberon" (1835–39) in the Wieland room. Among the results of journeys to the isle of Rügen (1837 and 1839) and to Norway (1840) are pictures in the Weimar Museum, one in the Dresden Gallery, and one in the National Gallery, Berlin.

After 20 years Preller resumed his favorite theme of the "Odyssey Landscapes" in 16 charcoal drawings (1854–56, National Gallery, Berlin), exhibited in Munich, 1858. The Grand Duke of Weimar commissioned him to paint the cycle in his New Museum, and Preller set out for Italy in 1859 to make new studies, which resulted in another modified series of 16 compositions, the cartoons of which are in the Leipzig Museum, and the encaustic paintings, executed 1863–68, constituting one of the chief ornaments of the Weimar Museum. The cycle traverses Homer's entire narrative. Although deficient in color, Preller is simple and impressive in line. He alone of his school was able to impart life to the figures of his austere and impressive landscape. He also etched 28 plates of good quality. Consult: Schöne, *Friedrich Prellers Odysseelandschaften* (Leipzig, 1863); Jordan, *Die Odyssee in Prellers Darstellung* (ib., 1873); Roquette, *Friedrich Preller* (Frankfort, 1883); Gensel, *Friedrich Preller* (Bielefeld, 1904).

PRELUDE, prĕl′ūd *or* prē′lūd (OF. *prelude,* Fr. *prélude,* from Lat. *præludere,* to play before, from *præ,* before + *ludere,* to play). In music, a short preface or an introduction to a more extended movement or composition, or to a dramatic performance or church service. It is in the same key with the selection which it is to introduce and to which it is intended as a preparation. For a long time the prelude constituted an essential portion of the older sonata and suites. In the seventeenth century Corelli in his *Sonate da Camera* introduced the custom of beginning all such works with *preludio* in slow time; hence the introduction (q.v.) in our modern sonatas and symphonies. The German composers developed this idea. In some of the suites of J. S. Bach the prelude is as important as any of the regular movements. When this master wrote the *Well-Tempered Clavichord* he prefaced each fugue with a prelude. Bach's organ preludes are masterpieces, notably the magnificent one in E flat introducing the St. Ann's fugue. Mendelssohn followed Bach in his six *Preludes and Fugues* for piano (op. 35). Chopin wrote a book of preludes which rank among the most beautiful of his shorter compositions, but they are entirely independent compositions, complete in themselves. Richard Wagner, from the time of his writing *Lohengrin*, uses the word "prelude" (*Vorspiel*) instead of overture. He aimed to give in the orchestral introduction to his dramatic works either a complete synopsis of the drama or its fundamental idea. He has, indeed, done this also in his overtures to *The Flying Dutchman* and *Tannhäuser*. Only in *Lohengrin* does the prelude end with a complete cadence; in all the other works the prelude leads without a cadence directly into the first act. See INTRODUCTION; OVERTURE.

PREMIER. See MINISTRY.

PREMIL′LENA′RIANS. See ADVENTISTS; MILLENNIUM; MILLER, WILLIAM.

PREM′ISE, IN LOGIC. See SYLLOGISM.

PREM′ISES (OF. *premisse*, Fr. *prémisse*, from ML. *præmissa*, premise, fem. sing. of Lat. *præmissus*, p.p. of *præmittere*, to send before, put before, from *præ*, before + *mittere*, to send, Skt. *mīv*, to push). In law, the introductory part of any legal writing, which usually contains preliminary statements or descriptions, necessary to a complete understanding of the main body of an instrument, as the "stating" part of a bill in equity, or the part of a deed which precedes the habendum clause and which contains a description of the property conveyed. As a result of this custom of speaking of the description of the property in a deed as the premises, popular usage has extended the meaning of the term to the land itself.

PREMIUM PLAN. A method of rewarding a worker for increased output by adding to his regular day pay a considerable fraction (usually one-half) of the wage value of any time he may save in completing the job assigned to him. The amount of time to be considered as saved is determined by comparing the time actually taken with a standard fixed in advance. This standard is usually based upon, though not necessarily identical with, the time formerly taken to perform the same or similar work, but in the case of a new job it may be fixed by the estimate of a foreman or other official. The arrangement is wholly voluntary. The worker is not under compulsion to better or even to equal the standard time. He is rewarded by the premium if he betters the standard performance, but no change is made in the regular day-wage agreement, and the premium plan thus may be and is used in establishments where the day-wage scale is fixed by collective bargaining and trade-union conditions. It is in use in a larger number of industrial establishments than any other system except day pay and straight piece rates. An identical system is said to have been long used in the British textile trades. In the United States the underlying idea was first advanced by Henry R. Towne, under the title of "gain sharing," in 1889; but the practical method of working it out for industrial use was proposed by F. A. Halsey in 1891, the name "premium plan" being given it by him. Certain difficulties arising in its use (especially when a serious overestimate has been made in setting the standard time and the workers' premiums thereby become inordinately large) have led to various modifications, of which the most important is attributable to James Rowan, of Glasgow, and is named after its author. In the Rowan premium the workers' share is determined, not by dividing with him the value of the time he saves, but by reducing the time saved to a percentage of the standard time allowed and then applying that percentage to the time actually taken. The formula is: *Time saved* ÷ *Time set* × *Time taken* = *Premium*, i.e., = the time the wage value of which is allowed as a premium. The important practical result of the Rowan plan is that, no matter what error has been made in setting the standard time, the worker's total earnings never can exceed double the standard day rate paid him.

PREMON′STRATEN′SIANS, called also NORBERTINES. A religious order which during the four centuries from the twelfth to the sixteenth was one of the most numerous and powerful monastic bodies in Europe. Its houses were especially numerous in Germany, but there were many monasteries also in England, where, because of the color of their habit, the Norbertines were called White Canons. The order was founded by St. Norbert, a native of Xanten in the diocese of Cleves, who was born about 1080. Norbert's youth had been irregular, but, converted at the age of 35, he afterward lived very strictly, devoting himself to the conversion of others. While engaged in this work he realized the need for missionaries to help the local clergy. He was soon joined by 13 companions to whom he gave the rule of St. Augustine and founded his first monastery (1120) in the forest of Coucy, near Laon, at a place called Pré Monstré (the field shown), or Prémonstré (foreshown), because Norbert felt that this was the place that had been pointed out to him by a vision. This became the mother house, and the order came to be named from it.

The order spread rapidly, first in France and the Low Countries and, after Norbert's election (1127) as Archbishop of Magdeburg, also in Germany. The abbot of the mother house at Coucy held the rank of general and was superior of the entire order. This continued to be the case until the French Revolution. St. Norbert also founded an order of nuns which spread almost as rapidly and as widely as that for men. Towards the close of the sixteenth century (1573), as the result of the Catholic reaction that followed the Council of Trent, a reform movement similar to that in the Franciscan Order made considerable modification of the existing Premonstratensian Institute. The reformed communities remained united with the older body, however, and in 1630 the modified rule was accepted by all the communities. In the seventeenth century numerous colleges were formed at the universities of western Europe. Since the end of the seventeenth century the order has declined in numbers. The female branch became almost extinct in the eighteenth century. There was a reawakening in the nineteenth century in the male branch, but the order has suffered much from suppression in Italy, Spain, the German Empire, and Switzerland. It flourishes in Austria and Holland, however, and there are some houses in England. There are also 11 houses of nuns in Europe. In the United States there is a house at Depere, Wis., which was founded from the abbey of Heeswijk (Holland). Consult: M. Geudens, *A Sketch of the Præmonstratensian Order in Great Britain and Ireland* (London, 1878); Currier, *History* *of Religious Orders* (New York, 1894); F. A. Gasquet, "The English Præmonstratensians," in *Transactions of the Royal Historical Society*, vol. xvii (London, 1903); Max Heimbucher, *Orden und Kongregationen* (Paderborn, 1907).

PRENCE, or **PRINCE,** THOMAS (1600–73). An American Colonial governor, born at Lechdale in Gloucestershire, England. He was one of the company of Puritans that settled in Leyden, Holland, and in 1621 he followed the Pilgrims to New Plymouth. He was a man of considerable wealth and soon became a person of influence in the Colony and was chosen to fill its most responsible offices. He was elected Governor in 1634 and 1638 and annually from 1657 until his death in 1673, the law requiring the Governor to live in Plymouth being waived in his favor. From 1635 until 1637 and from 1639 until 1656 he was one of the assistants, and in 1654 he was authorized to establish in the Kennebec settlement a government subordinate to that at Plymouth. In religious affairs he represented the intolerance of his age, but, on the other hand, he may be considered the founder of the New England public schools, for he zealously advocated the establishment of a system of free education and secured the passage of a law giving profits of Cape Cod fisheries to the support of a school in Plymouth. Consult Francis Baylies, *Historical Memoir of the Colony of New Plymouth* (2 vols., Boston, 1866).

PREN'DERGAST, EDMOND FRANCIS (1843–). An American Roman Catholic archbishop. He was born at Clonmel, Ireland, but came to the United States in 1859. After studying at St. Charles Seminary, Overbrook, Philadelphia, he was ordained a priest in 1865. He was an assistant at St. Paul's, Philadelphia, and at Susquehanna Depot, Pa.; served as rector at Bristol, Pa., for four years, at Allentown, Pa., until 1874, and thereafter at St. Malachy's, Philadelphia, until 1897; and was vicar-general of the archdiocese in 1895–97. Father Prendergast was consecrated auxiliary bishop of Philadelphia in 1897 and was appointed archbishop in 1911.

PRENDERGAST, SIR HARRY NORTH DALRYMPLE (1834–1913). A British soldier, born in India. He was educated at Brighton College and at the East India Company's College at Addiscombe, entered the military service in 1854, was with the sappers and miners during the Persian War of 1856–57, and as a member of the Central India field force distinguished himself in 1858. In the Abyssinian War (1867–68) he commanded the detachment of Madras sappers and miners and in 1885–86 commanded the expedition that obtained the annexation of Upper Burma to the British Empire. He then (1886) commanded all the British forces in Burma and subsequently occupied various posts, including that of officiating Resident at Mysore and Chief Commissioner of Coorg in 1891–92. In 1887 he attained the rank of general of Royal Engineers. He was created K.C.B. in 1885 and promoted G.C.B. in 1902.

PRENDERGAST, JOHN PATRICK (1808–93). An Irish politician and historian, born at Dublin. He was educated at Trinity College, Dublin, was admitted to the bar in 1830, and was active as a writer of pamphlets and newspaper articles from the Liberal Nationalist point of view. His chief work, however, was done in connection with Irish history, in which he published the following studies: *The History of the Cromwellian Settlement of Ireland* (1863; 2d ed., 1875); *The Tory War in Ulster* (1868); *Ireland from the Restoration to the Revolution* (1887).

PRENDERGAST, MORRIS BRAZIL (1861–). An American landscape and figure painter. He was born in Boston and studied in Paris at the Julian and Colarossi academies (1892–96) and later independently in Italy. Upon his return to the United States he settled in Boston, but in 1914 removed to New York. His subjects are usually landscapes with figures, and he is especially known for his Massachusetts seashore views, conceived in a highly individual manner. He excels equally in oil and in water color, in paintings decoratively conceived but true to nature in a large way. The color is rich and powerful, the sentiment always joyful. A large exhibition of his paintings was held in New York in 1915. Among his best works are: "Chrysanthemum Market"; "The Fête"; "Taking the Air"; "On the Cliffs"; "The Merry Maidens"; and a "Group of Figures, No. 2" (1915). Prendergast became one of the leaders of radical tendencies in American art, and was elected president of the American Association of Painters and Sculptors and a member of the Boston and New York Water Color societies.

PREN'TICE, GEORGE DENISON (1802–70). An American journalist, born at Preston, Conn. He graduated at Brown University in 1823, studied law and was admitted to the bar, but never practiced, and in 1828 became the first editor of the *New England Review*. In 1830 he removed to Kentucky, and there published his popular campaign life of Henry Clay (1831). He established in the Whig interest at Louisville in 1830 the *Journal*, which soon came to be the best-edited and most widely read newspaper in that region. He did much to increase the *Journal's* circulation and his own fame through originating the brief, pointed paragraph, theretofore almost unknown. A collection of these paragraphs, edited by himself, appeared in 1860 as *Prenticeana* (rev. ed., 1870). Prentice was a vigorous opponent, and was so frequently involved in duels as to become a subject of jest. He was antagonistic to secession, and it is said that his editorials had an important influence in keeping Kentucky from withdrawing from the Union. He published in the *Journal* considerable verse, later edited by J. J. Piatt (Cincinnati, 1876). He also contributed for some time a column of Wit and Humor to Robert Bonner's New York *Ledger*. He retired from the editorship of the *Journal* in 1867. Consult the sketch by J. J. Piatt, in the edition of the *Poems* above referred to, and Henry Watterson, *Memorial Address* (Cincinnati, 1870).

PREN'TISS, BENJAMIN MAYBURY (1819–1901). An American soldier, born at Belleville, Va. (now W. Va.). In 1841 he settled in Quincy, Ill., and three years later he became first lieutenant of a militia company organized to aid in quelling Mormon disturbances. He served during the Mexican War as a captain of volunteers, and at the outbreak of the Civil War organized a company which he offered to the Federal government. Soon afterward he was appointed colonel of the Seventh Illinois, and on May 17, 1861, was promoted brigadier general of volunteers and was given command of Cairo, then one of the five principal military centres of the Union. In September, however, he was succeeded by General Grant. On Dec. 28, 1861, he defeated the Confederates at Mount Zion. On April 3, 1862, he joined Grant at Shiloh, and was given command of the new Sixth Division, composed of raw troops. This division with that of Sherman occupied the most exposed position, and upon them fell the unexpected onslaught of the Confederates on April 6. After making a creditable resistance General Prentiss and the greater part of his division surrendered. He was exchanged in October, and the next month was commissioned a major general of volunteers while attending the court-martial called to try Fitz John Porter (q.v.). On July 3, 1863, while commanding at Helena, Ark., he repulsed an attack by a superior force of Confederates under Generals T. H. Holmes and Sterling Price. On Oct. 28, 1863, he resigned his commission. He afterward went to reside at Quincy, Ill., where he engaged in business.

PRENTISS, George Lewis (1816–1903). An American clergyman and theologian, a brother of Sergeant Smith Prentiss. He was born at Gorham, Me., graduated at Bowdoin College in 1835, and taught for a year in Gorham Academy. Subsequently he spent two years at Halle and Berlin and some time in England. In 1845 he became pastor of the South Trinitarian Church at New Bedford, Mass., and from 1851 to 1858 was pastor of the Mercer Street Presbyterian Church, New York, resigning to seek health by foreign travel. Of the Murray Hill Church of the Covenant, New York, which he had organized, he served as pastor in 1862–73, and thereafter until his retirement in 1896 he was professor of pastoral theology, Church polity, and mission work in Union Theological Seminary. He published a volume on *The Union Theological Seminary* (1889), and as a supplement to this *The Agreement between Union Seminary and the General Assembly* (1891). His autobiography is contained in *The Bright Side of Life* (2 vols., New York, 1901).

His wife, Elizabeth Payson Prentiss (1818–78), was born in Portland, Me., a daughter of the Rev. Edward Payson (q.v.). She was educated in Portland and Ipswich, taught school for a few years, and was married to Dr. Prentiss in 1845. She was the author of books for children and of several popular religious works, the most important of which was *Stepping Heavenward* (first published serially in the Chicago *Advance*, 1869). Her life and letters were published by her husband (New York, 1882).

PRENTISS, Sergeant Smith (1808–50). An American lawyer and orator, born in Portland, Me. He graduated at Bowdoin College when 19 years old, settled in Natchez, Miss., and was admitted to the bar at 21. His keen intellect and oratorical ability made him at once successful. In 1832 he removed to Vicksburg. In 1835 he was elected as a Whig to the State Legislature, and two years later was returned to Congress, but was unseated. He was reëlected, however, in the following year, and this time was allowed to serve. In 1840 he made speeches in many parts of the country urging the reelection as President of William Henry Harrison, but withdrew from politics in 1842. In 1845, having by an unfavorable legal decision lost much of his property, he removed to New Orleans, where he practiced with success. A *Memoir* of Prentiss was edited by his brother, George Lewis Prentiss (q.v.) (2 vols., New York, 1855, 1870).

PRENZLAU, prĕnts'lou, or **PRENZLOW.** A town in the Province of Brandenburg, Prussia, on the Ucker and the Lower Ucker Lake, 58 miles north-northeast of Berlin (Map: Germany, E 2). Among its churches is the handsome Gothic St. Mary's, built of brick. The town has a Gymnasium and a teachers' seminary. Sugar, cigars, beer, machinery, woolen yarn, leather, oleomargarine, and finished wood products are manufactured. Prenzlau is first mentioned in the twelfth century and was the capital of the Ucker Mark. It is noted as the scene of the surrender of the Prussians under Hohenlohe to the French under Murat in 1806. Pop., 1900, 20,228; 1910, 21,431.

PREPARATION (Lat. *præparatio*, from *præparare*, to make ready beforehand, from *præ*, before + *parare*, to make ready). A term in music, applied to the introduction of dissonances. According to the older theorists no dissonance could be introduced without being *prepared*, i.e., the note forming a dissonance had to occur in the preceding chord and in the same part as a note of harmony. See Consonance; Dissonance.

PREPOSITION (OF. *preposition*, Fr. *préposition*, Lat. *præpositio*, from *præponere*, to place before, from *præ*, before + *ponere*, to place). In grammar (q.v.), an indeclinable word preceding a noun or a pronoun in an oblique case and showing the relation of such a noun or pronoun to another noun, pronoun, adjective, or verb. Originally the preposition was only a specialized form of the adverb and is consequently in the last analysis a stereotyped case form of a noun. Thus, the Indo-Germanic **peri*, around, which is represented by Skt. *pari*, Gk. *περί*, Lat. *per*, Goth. *faír*, and Ger. *ver-* in such verbs as *vergehen*, to go to destruction, was primarily the locative case of an inferred noun **per-*, connected with the verbal root **per*, to cross. The adverbial nature of prepositions is shown by their use in verbal compounds, as Lat. *per astra*, through the stars, besides *perire*, to go through, to perish. In an earlier period the preposition did not "govern its case." The preposition was purely adverbial, and the case of the noun depended altogether on other syntactic considerations. In such a sentence as Latin *it ad flumen*, he goes to the river, *ad* primarily pointed out the direction, while *flumen* was an accusative denoting in itself the end of the motion implied in the verb. The decay of feeling for the force of inflectional endings led to an increased value of prepositions, which developed from local adverbs to words that actually governed case relations. The term "preposition" is faulty, since these words may in many languages stand after the noun which they govern, and they are then sometimes called postpositives or postpositions. In English the preposition has lost in great part its adverbial character, although traces of this value survive in such uses as *to see a thing through*, as compared with *to see through a thing*. As connectives, they govern the objective case only, as *in the house, to the house, from the house*, where more conservative languages would employ a locative, an accusative, and an ablative respectively. The possessive case has been supplanted in great measure by the objective case with *of*. The principle is frequently maintained that a phrase or sentence should not end with a preposition on account of the weak termination thus given. Many of the best literary authorities, however, disregard this, and there is no good reason for a rigid observance of such a rule either on stylistic or on historical grounds. Consult Berthold Delbrück, *Vergleichende Syntax der indogermanischen Sprachen*, vol. i (Strassburg, 1897), and Michel Bréal, *Essai de sémantique* (6th ed., Paris, 1913).

PREPO'TENCY (Lat. *præpotentia*, superior power, from *præposse*, to be superior in power, from *præ*, before + *posse*, to be able). The power of exerting a preponderating influence in the act of reproduction. Thus, some one male ancestor excelling in some physical or mental character, such as form, color, and disposition, is known to have transmitted his qualities through many generations. Not only may the individuals of a normal species thus transmit their marked or superior qualities, but also aberrations or sports may thus be transmitted, unless bred out by crossing. In certain historic families some one ancestor and after him others in the same family have shown great power in transmitting their likeness through the male line, as in the case of the Austrian emperors of the house of Hapsburg, and so with the mental qualities of certain Roman families. It is especially noticeable among domesticated animals, where qualities and ancestry have long been recorded. The famous bull "Favorite" is said to have exerted a prepotent influence on the short-horned race of cattle. The Jews are more prepotent than the English race, are of better, i.e., purer, breed, but the prepotency declares itself only when intermarriages take place. In nature prepotency may (1) arise spontaneously and abruptly along with sports in one or more directions, or gradually with the help of natural selections; (2) it may be gradually acquired when a few individuals of any given species or variety are so isolated that inbreeding is inevitable. In cases of crosses between different breeds, says Redfield, prepotency appears to lie with that breed which has had its characters most firmly fixed by in-and-in breeding. Hence animals of pure blood are prepotent over mongrel stock. In the life of an individual a character is more firmly fixed in middle life than in youth, and observation of horses has shown that the older individual is or tends to be more prepotent than young males.

Consult J. C. Ewart, *The Penycuik Experiments* (London, 1899), and Charles Darwin, *The Variations of Animals and Plants under Domestication* (authorized ed., 2 vols., New York, 1900).

PRERADOVIĆ, prå-rä'dô-vĭch, Peter (1818–72). A Croatian poet, born at Grabonitza. He entered the Austrian army, took part in the war with Italy, and rose to the grade of general (1866). When he was stationed in Dalmatia (1842), he took up the study of his native tongue, which he had almost forgotten, and began to write in that language. His works, which rank him as the greatest Croatian poet of the century, include *Prvenci* (1846), *Nove pjesme* (1851), and the epics *Prvi ljudi* and *Slavenski Dioskuri*. The collected edition, *Pjesnička Djela*, published at national expense (1873), contains a biography by Trnski and a critical study by Marković. A few of his poems were turned into German by Spicer (1895).

PRE'-RAPH'AELITES. A term which, properly signifying the Italian painters before Raphael, is now commonly applied to a group of English painters in the nineteenth century. It was first used in this sense of a group of young German artists who, after their expulsion from the Vienna Academy in 1810, established themselves in the deserted Franciscan convent of San Isidoro at Rome. They formed an art brotherhood which was to live in seclusion and sanctity, and were nicknamed the German Lay Brothers, and afterward the Nazarenes. Their object was the restoration of Christian art to its mediæval purity, and they took as their guides the Pre-Raphaelite masters. They regarded the mental conception as the chief feature of a work of art, and form as the chief vehicle of its expression, color being subsidiary. The leader and moving spirit of the school was Overbeck (q.v.); other members were Cornelius, the brothers Schadow, Philip Veit, Schnorr von Carolsfeld, Führich, and Steinle. They afterward scattered throughout Germany—some, like Cornelius, relinquishing their tenets; but Overbeck remained at Rome, faithful to the end. Their art is characterized by a certain naïveté and a very imperfect technic.

The name is most commonly applied to the school that arose in England about the middle of the nineteenth century and accomplished great results both in art and literature. The movement originated with a band of seven young men—Dante Gabriel Rossetti and his brother William Michael, John Everett Millais, William Holman Hunt, Frederick George Stephens, Charles Collinson, and Thomas Woolner the sculptor. The brotherhood was formed in the autumn of 1848, and its ruling spirit was D. G. Rossetti. The latter had been a pupil of Ford Madox Brown (q.v.), who both influenced and was influenced by the brotherhood, although he never joined it. Its painting really began with "The Eve of St. Agnes," a picture by Holman Hunt, who was the first to realize the purity of work in the early Italian painters and to seek to rival their sincerity. For a time in 1850 they published a periodical called *The Germ*, in which some of Rossetti's earliest poetical work and his fine prose study "Hand and Soul" first appeared.

Their art represents a reaction against the pseudoclassic, imitative tendencies of their day, as manifested particularly in historic and genre painting. They sought inspiration in the age preceding Raphael, a time when art was simple, sincere, and religious. The most prominent features of their art were its mystic and religious sentiment, which appeared especially in the choice of subject, the spiritual quality of their pictures, and a very careful and conscientious execution, with great emphasis on truth of detail. These principles were violently attacked and with some justice, since mysticism sometimes led to affectation and the exaggerated rendition of detail caused the neglect of the ensemble. Millais afterward deserted the brotherhood, but they found an eloquent defender in John Ruskin and strongest of followers in Sir Edward Burne-Jones, a disciple of Rossetti. William Morris and Walter Crane also were associated with them and influenced by their principles. The movement had many other followers, and even to-day its tendencies are reflected in the work of some British artists. Their chief influence was to restore spirituality and poetic feeling, which had well-nigh perished in British art, and their maxims also led to a more thorough study of form than had been usual. In literature the movement may really be considered as a recurrent phase of the wider Romantic movement, the teaching of which had been somewhat obscured in the half-century since its proclamation in England. In its looking back to the Middle Ages it harmonized with the Oxford movement of its own day and with the Gothic revival of Pugin. Its mental attitude is magnificently represented in the highly colored, imaginative "painter's poetry" of Rossetti, in much of the work of William Morris, and in some of Swinburne's.

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PRERAU, prā′rou. A town of Moravia, Austria, situated 40 miles northeast of Brünn (Map: Austria, E 2). It contains an ancient castle, a Gothic town hall, a Bohemian college, an agricultural and a trade school. There are considerable manufactures of textiles, also of sugar, hardware, and agricultural machinery. Prerau was formerly the chief seat of the Moravian Brethren. Pop., 1900, 16,727; 1910, 20,245.

PREROG′ATIVE (Fr., from Lat. *prærogativa*, from *præ*, before + *rogare*, to ask). In English law, certain rights and privileges pertaining exclusively to the sovereign, free from the control of any other power in the state. Once the right of taxation, the right to administer justice, the right to control and direct the military and naval forces of the state, and the power to grant franchises and other privileges were royal prerogatives.. A persistent and effective struggle was carried on, first by the barons and later by the commons, to narrow the scope of the royal prerogative, which survives to-day only as a legal fiction. Consult: William Stubbs, *Constitutional History of England* (6th ed., Oxford, 1897); Sir William Blackstone, *Commentaries* (4th ed., 2 vols., Chicago, 1899); Pollock and Maitland, *History of English Law* (2d ed., 2 vols., Cambridge, 1903).

PRESBURG. See PRESSBURG.

PRES′BYO′PIA. See SIGHT, DEFECTS OF.

PRES′BYTER (Lat. *presbyter*, from Gk. πρεσβύτερος, *presbyteros*, elder, comparative of πρέσβυς, *presbys*, old man). The term was used by the Jews to designate the chief official of the synagogue or a member of the Sanhedrin. Its use in Acts xiv. 23, however, in all probability, has no reference to officials modeled after the synagogal officers, but to elder (mature) men of the newly formed Christian communities, into whose hands was committed the general religious and administrative care of the converts. The varied functions exercised by these elder men are evidenced in the case of the officials referred to in 1 Thess. v. 12, and were distributed among distinctive officers only as the growth of the Church's work compelled complexity of administration. This primitive grouping of functions in single officials is seen also in the reference to elders in 1 Tim. v. 17, and possibly in Titus i. 5. See BISHOP; ELDER; ORDERS, HOLY; PRESBYTERIANISM.

PRES′BYTE′RIAN ALLIANCE. See ALLIANCE OF THE REFORMED CHURCHES HOLDING THE PRESBYTERIAN SYSTEM.

PRES′BYTE′RIANISM AND THE PRESBYTERIAN CHURCHES. Presbyterianism is a system of Church government by presbyters, or elders. This fact distinguishes it from other forms of Church government—the papal, the episcopal, and the congregational. "In the presbyterian system all ecclesiastical authority is in the body of presbyters called by Christ, and ordained by presbyters to rule over the Church. . . . The Presbyterian churches exalt the Scriptures above the Church, and urge that Christian men and Christian assemblies should wait upon God and listen for the voice of His Spirit speaking infallibly in his Word." Calvin has been regarded as the founder of Presbyterianism, and it is true that he was the first to organize the Reformed church on a presbyterian model; but it should be remembered that government by a body of elders was maintained by the Waldensians and others from a much earlier age.

The name being derived from the form of Church government, the term "Presbyterian" properly includes all those who accept the presbyterian government, even though there may be differences in their theological beliefs. So, in the general Presbyterian Council held at Edinburgh in 1877, the German state establishments and the French and Dutch Reformed churches were represented. Presbyterians are generally Calvinistic in doctrine and for the most part accept the Westminster Assembly's Confession of Faith and the Larger and Shorter catechisms as the symbols of belief. They do not, however, all agree in the interpretation of those standards.

Presbyterian Polity rests on representative government and an ascending series of appellate courts. There are three classes of officers in every well-organized church—the minister or pastor, who is also called a teaching elder; the body of ruling elders, who, with the pastor, have the spiritual oversight of the church; and the deacons, who have care of the relief of the poor and in some churches manage also the financial affairs. The primary governing body is the church session, which consists of a pastor and the ruling elders, chosen by the congregation. Elders were formerly chosen only for life, but now in some branches of the church hold office for a term of years. The church session is under the control of the presbytery to which it belongs. The presbytery consists of the pastors and churches of a given district. The presbyteries are united in a larger governing body called the synod. The larger synods of the United States are representative bodies consisting of ministers and elders chosen from the presbyteries according to some definite ratio. The smaller synods are undelegated bodies, all the ministers and one elder from each church constituting the body. In some of the smaller branches of the church the synod is the ultimate court. The completed system, however, includes a General Assembly, which is the supreme court. It meets annually and consists of ministers and elders chosen by the respective presbyteries in some definite ratio. Appeals and complaints are carried from the lower to the higher judicatory, beginning with the session and terminating with the General Assembly. In the Presbyterian church in the United States appeals from the synods to the General Assembly are limited to cases involving doctrine or government. In the other Presbyterian churches appeals from the synods to the Assembly are allowed in all cases. The Assembly also has general jurisdiction over the various agencies of the church, such as the theological seminaries and the boards doing the benevolent and missionary work.

Presbyterian Churches in Scotland. Christianity was probably introduced into Scotland about the beginning of the third century, and the claim has been made that the early Celtic churches were nonprelatical. However that may be, they were later brought into the Roman obedience and remained thus until the Reformation. Since that time the history of the Presbyterian church in Scotland has been practically a history of the country. The life of John Knox (q.v.) is the epitome of the Scottish Reformation. The first public movement towards the organization of the Presbyterian church was the drawing of a bond known as "The First Covenant." It was signed at Edinburgh, Dec. 3, 1557, by some of the most powerful Scottish barons and by many of the lesser nobility. This act brought forth a proclamation from the Queen Regent forbidding any one to preach or administer the sacrament without the authority of a bishop, but the Reformed party triumphed, and in 1560 Parliament abolished the Roman Catholic form of worship, adopted a confession of faith agreeing with those of the Reformed churches of the Continent, and appointed ministers of the Protestant faith to various parts of the Kingdom. On Dec. 20, 1560, the first General Assembly of the Church of Scotland was held in Edinburgh. It consisted of six ministers and 34 laymen. In this same year a committee of five persons, including Knox, had been appointed "to commit to writing their judgments touching the reformation of religion." Their *First Book of Discipline* was rejected by the nobles, though accepted by the church. In 1581 the *Second Book of Discipline* was adopted by the Assembly and is still in force together with the Westminster standards. The undaunted perseverance of John Knox and Andrew Melville at last procured complete recognition of the Calvinistic faith and the Presbyterian form of government as the established religion of Scotland. This was ratified by Parliament, with the consent of King James (I of England and VI of Scotland) in 1592. His duplicity, however, soon made itself manifest when he tried to force the episcopal polity on his Scottish subjects. In this he was followed by his successors, Charles I, Charles II, and James II. The ecclesiastical affairs of the country were in great confusion. In 1610 the Glasgow Assembly restored the episcopal government. In 1638 the Assembly rescinded the acts of six previous assemblies, condemned and deposed the bishops, and abolished episcopacy. In 1661 Parliament passed the Rescissory Act, which repealed the legislation of the previous 21 years, and episcopacy was restored to its former position. After the accession of William and Mary, in 1689, civil and religious liberty was restored and Presbyterianism was revived. In 1690 an Act of Settlement was passed, prelacy done away with, and the Westminster Confession adopted. Though both England and Scotland had been under one crown for nearly a century, they still continued separate kingdoms, each with its own Parliament and executive, independent of the other, but upon their union in 1707 the position of Presbyterianism was guaranteed, and it has since continued to be the established religion of Scotland. The Church of Scotland is the Established church, from which the other bodies have from time to time withdrawn. It differs from them chiefly in maintaining a connection with the state.

The question of patronage caused great dissension at an early period, for the Scotch claimed the right to elect their own clergy, or at least the privilege of vetoing an unsatisfactory appointment. A worldly spirit manifested itself, men who were lax in principle obtained important positions, and strange doctrines were taught; the result was the secession of several important bodies. The first party to withdraw were the Covenanters or Cameronians, who objected to the interference of state with church, and who therefore, on July 27, 1712, renewed the covenants (q.v.). They were lineal descendants of the covenanted presbytery and logically true to their principles. The former Covenanters protested against the errors of prelacy, and their successors were now equally emphatic against the backsliding of presbytery. Another body, led by Ebenezer Erskine (q.v.), came out in 1733, forming a party known as the Associated Presbytery or the Seceders. Again, in 1760, another body left the mother church. These men were known as the Relief Synod. On May 13, 1847, these churches united, forming the United Presbyterian church of Scotland.

The Free church of Scotland originated in a protest against civil patronage of the church, the civil courts claiming not only the right to control the temporalities of the church, but also the power to rule in spiritual affairs. In 1834 the General Assembly passed the Veto Act, under which the church courts might reject a "presentee" of the state, if by them deemed unfit for his office. This Act was annulled by the civil courts and the House of Lords in 1839. The Assembly could not agree thus to surrender what it believed to be a right bestowed by the head of the church. The collision between the civil and ecclesiastical courts was so direct that those who held to the independence of the church saw only one way of relief, which was to leave the Established church. Therefore, in 1843, 470 members, under the lead of Chalmers, Candlish (qq.v.), and others, signed an Act of Separation and Deed of Demission, and the Free church of Scotland was the result. It renounced all benefits of establishment, but expressed its firm adherence to the doctrine and maintained the forms of worship and discipline of the Church of Scotland.

The United Free church of Scotland was the result of a movement towards union between the two great bodies which had left the established church. On Oct. 31, 1900, a Uniting Act was formally adopted by the Free Church Assembly and the United Presbyterian Synod sitting in Edinburgh. On the following day the ministers of the two churches, some 3000 in number, marched in procession from their respective halls to Waverley Market, where they convened as the first General Assembly of the United Free Church. Principal Rainy was the first moderator. The new church received from the United Presbyterian church 637 ministers and 199,089 communicants; from the Free church, 1149 ministers and 296,089 communicants. A minority of 27 ministers and 500 elders voted against the union, and resolved to continue the Free church.

The Reformed church of Scotland, descended from the Covenanted church, glories in its adherence to the principles for which Cameron, Renwick, and Cargill shed their blood. In 1660 the Act of Supremacy was passed, which constituted the King supreme judge in all matters, civil or ecclesiastic; and the oath of allegiance, which declared it to be treason to deny the supremacy of the King in church and state, was imposed. The Covenanters asserted their belief in the covenants and renounced their allegiance to the King on the ground that he had broken his vow, made at his coronation, and had forfeited his right to rule. As a matter of course persecution followed, the leaders perished on the scaffold, and the people were left without a head. They resolved themselves into societies for worship and mutual edification. This caused them to be called the Society People, though they spoke of themselves as the Persecuted Remnant. Later the spirit of compromise entered the church, and, in the desire to comply with the King's wish to include as many as possible of the prelatic clergy, the church received a large number of the very men who had been most earnest in its persecution under the old régime. The Society People could not approve of the conduct of either King or church, and it was therefore impossible for them to identify themselves with the Established church. For lack of sufficient number of ministers, the first presbytery of this people was not formed till Aug. 1, 1743; but from this time the Reformed Presbyterian church went steadily forward, adhering to its peculiar principles with great firmness of purpose, increasing, indeed, with such rapidity that it was for a time beyond its power to supply ministers sufficient for the needs of the people. Later, however, it gradually declined, and nearly all its members joined either the Free or the United Presbyterian church of Scotland.

Presbyterian Church of England. In England the principles of the Puritans were practically Presbyterian, although they were for the most part more concerned with resistance to power, exercised as they believed against the Word of God, than with the development of church government. Still the ministers of London and its vicinity organized a presbytery at Wandsworth in Surrey in 1572, and other presbyteries followed in spite of the hostility of Queen Elizabeth. In July, 1643, in obedience to a summons from Parliament, the Westminster Assembly met in Westminster Abbey and continued in session until 1647. The documents known as the Confession of Faith, the Form of Church Government, the Directory for Worship, and the Larger and Shorter catechisms, drawn up by this Assembly, were approved by Parliament in 1648. (See Creeds and Confessions.) Parliament in 1647 passed an ordinance making Presbyterianism the established religion of England, but this law never went into practical effect. When Cromwell and the Independents came into power, their influence was thrown against Presbyterianism, partly perhaps because of the resistance of the latter to the trial and execution of Charles I. After the Restoration, by command of Charles II, the Savoy Conference (q.v.) was held at the residence of the Bishop of London in 1661. The purpose was, nominally, to alter and reform the liturgy in such a way as to meet the feelings of those who had serious scruples against its use. The negotiations were a failure, as the bishops refused to make any changes. This conference was followed by the Act of Uniformity, which took effect Aug. 24, 1662. Two thousand ministers who would not consent to abjure the Solemn League and Covenant or to be episcopally reordained, resigned their charges or were ejected from them. Sixty thousand church members were imprisoned or fined, 5000 of whom died in prison. After the Revolution and the Act of Toleration in 1689, Presbyterianism flourished again. In 1691 the Presbyterians entered into articles of agreement with the Independents, giving up presbyteries and synods. Arian and Socinian doctrines prevailed to such an extent that the name Presbyterian became synonymous in England with Unitarian. In the meantime there existed in England a few congregations connected with the Scottish church formerly known as the Secession church, later as the United Presbyterian church. At the formation of the Free church of Scotland, the greater number of the English churches connected with the church of Scotland espoused the cause of the Free church and took the name of the Presbyterian church of England. On June 18, 1876, the first synod of the Presbyterian church of England was constituted by the union of the Presbyterian church and the United Presbyterian.

Irish Church. The history of Presbyterianism in Scotland is also essentially its history in Ireland. The first presbytery in Ireland was organized in 1642 by Scottish chaplains accompanying the army sent there to subdue the Great Rebellion of that period. The Presbyterian population increased by immigration from Scotland. Early in the eighteenth century doctrinal differences began to appear, and in 1726 a schism took place. Those who would not subscribe to the Westminster Confession formed themselves into the Presbytery of Antrim. The orthodox body was called the Synod of Ulster. Scottish Seceders, coming over in the middle of the eighteenth century, did much to maintain purity of doctrine in the northern provinces. Owing to laxity of doctrine in the Irish church, the Covenanters made steady progress, and in 1792 their first Irish presbytery was formed. In 1835 the Synod of Ulster endeavored to stem the tide of lax doctrine by requiring subscription to the Confession of Faith. The grounds of separation between them and the Seceders being thus removed, a union was happily consummated in 1840.

The Presbyterian Synod of Seceders in Ireland was formed in 1818 by a union between the two sections of the Scottish Secession church in Ireland, the Burghers and the Antiburghers. The division arose in Scotland in 1747 in regard to the propriety of an oath administered to the burgesses which pledged the taker to support "the true religion presently professed within the realm and authorized by the laws thereof." Those who defended the taking of the oath were called the Burghers; those who condemned it the Antiburghers. This controversy spread to Ireland. At the time of the union of these two bodies there were 97 ministers. In 1840 the Synod of Seceders united with the Synod of Ulster, taking the title of the Presbyterian church in Ireland.

Calvinistic Methodist or Presbyterian Church of Wales. This body has been Calvinistic in its doctrine from its beginning. In 1735–36 Howell Harris, Howell Davis, and Daniel Rowlands began to preach in different parts of Wales. Whitefield heard of them and worked with them, and for a short time the Calvinistic Methodists of Wales were associated with the Methodists of England, but after 1748 Whitefield ceased to act as their head and their connection with England was gradually broken off. In 1811 they held a General Synod at Bala, when 21 persons were ordained to the ministry. In 1864 the churches of North and South Wales came under the control of one General Assembly. In this church every elder is a member of presbytery. There is a branch of this church in the United States.

Presbyterian Church of the British Colonies. In Canada the Presbyterian church dates from the Conquest in 1759. Its first preacher is supposed to have been the Rev. George Henry, chaplain of a British regiment stationed in Quebec. In Montreal the first Presbyterian church was organized in 1790. In Upper Canada the pioneers of Presbyterianism were from the Reformed Dutch church. One of the earliest missionaries was the Rev. Robert McDowell, who was sent by the Classis of Albany in 1798. Other ministers were sent from Scotland, and later, with immigrants from Scotland and the north of Ireland, Presbyterianism took firm root in Canada. In 1831 the Synod of the Presbyterian Church of Canada was formed in connection with the church of Scotland. It consisted of 25 ministers. The Secession church of Scotland was also represented and was known as the Synod of the United Presbyterian Church in Canada. In 1844, after the disruption in Scotland, a division took place in the Presbyterian church in Canada, and 25 ministers withdrew, calling themselves the Presbyterian church of Scotland. In 1861 this body and the United Presbyterian church in Canada united under the name of the Canada Presbyterian church, with a roll call of 226 ministers. The same churches in the lower provinces also united as the Presbyterian church of the Lower Provinces. After the confederation of the provinces which now form the Dominion of Canada, there arose a natural desire for an ecclesiastical union which had long been contemplated. Negotiations were begun in 1870, and the union was happily brought about, June. 15, 1875, in the city of Montreal, the church thus united numbering 634 ministers and 90,658 communicants.

There are also Presbyterian churches in all of the other colonies. The Australian Presbyterian church was founded while that country was still a penal colony. In 1836 the first Presbyterian minister was there in the person of Rev. Mr. Clow, a retired chaplain of a Highland regiment. The representatives of the different forms of Presbyterianism united in 1867 on the abolition of state aid. In August, 1901, the Presbyterian churches of Australia united and signed the deed in Sydney, the Rev. Dr. Meiklejohn being the first moderator of the new body.

The New Zealand Presbyterian church was founded about the year 1840. In 1900 it comprised two assemblies—the Otago and the Southland—with 201 ministers and about 26,000 communicants, and its contributions were about $310,000. On Oct. 31, 1901, these two bodies united and now form the Presbyterian church of New Zealand. The first united Assembly was held in Dunedin, and the Rev. James Gibbs was made moderator.

The Presbyterian church of South Africa comprises three branches: the General Assembly of the Presbyterian Church of South Africa, the Synod of the Free Church Mission of Kaffraria, the Synod of the Presbyterian Church of Basuto Land.

The Presbyterian church of Jamaica numbers 30 ministers and about 12,000 communicants.

Presbyterian Church in the United States of America. This body was founded by the Scottish, Irish, French, German, and Dutch Reformed immigrants. Fugitives from persecution, they took refuge in the more liberal colonies of Pennsylvania, Maryland, New Jersey, Virginia, and the Carolinas, and some in New England. The founding of a Presbyterian colony on Massachusetts Bay took place in 1625. With the arrival of more colonists in 1629 a church was fully constituted under the Rev. Samuel Skelton. Christ's Presbyterian Church was established at Hempstead, Long Island, in 1644. The Rev. Francis Doughty, an English Presbyterian minister, was the first Presbyterian to preach in New York. He ministered there from 1643 to 1648. A Presbyterian church, however, was not organized until 1717. Francis Makemie, an Irish minister of the Presbytery of Laggan, is considered the father of organized Presbyterianism in America. He founded several churches in Maryland and Virginia. Later he crossed the ocean to appeal to the mother church for help. In 1707 he was imprisoned in New York for preaching without permission, for at that time the Episcopal church was practically the Established church, and no dissenter was allowed to preach without a license. In the meantime other Presbyterian churches had been founded—one in Freehold, N. J., in 1692; one in Philadelphia, in 1698, under the care of Jedediah Andrews. The first American presbytery was organized in Philadelphia, probably in 1706—the precise date having been lost—and consisted of seven ministers: Francis Makemie, Samuel Davis, John Hampton, and George McNish, from Ireland; Nathaniel Taylor and John Wilson, from Scotland; and Jedediah Andrews, from New England. The growth of the church was rapid, and in 1716 the Synod of Philadelphia was formed, consisting of four presbyteries: Philadelphia, with six ministers and churches; New Castle, six ministers and churches; Snow Hill, three ministers and churches; Long Island, two ministers and several churches. There is no record at this time that any standards of doctrine had been adopted by the synod, although as most of the ministers were of Scottish descent, it is probable that the Westminster standards were those to which the young church adhered. In 1729, by an "adopting act," the synod made the Westminster Confession of Faith their doctrinal standard, "as being in all the essential and necessary articles good forms of sound words and system of Christian doctrine." They also agreed that no one should be ordained to the ministry or received into membership who had scruples as to the Confession, "save only about articles not essential and necessary to doctrine, worship, and government." The ministers from abroad, however, were more strict in their doctrinal ideas and laid more stress on scholarship than the native ministers, who insisted more on a living Christian experience, and who, in view of the great needs of the new country, were disposed to receive into the ministry students who were sound in doctrine, but whose opportunities for education had been limited. In 1739 party feelings were stirred by the visit of George Whitefield, and the synod was divided into a party warmly befriending revivals and a party standing aloof from that form of work. By 1741 this dissension resulted in a schism, and two synods were formed—the Old Side, called the Synod of Philadelphia, insisting on a thoroughly educated ministry; the New Side, or Synod of New York, which laid more stress on piety and zeal. There was but slight difference between the two bodies as to doctrine or discipline. After a separation of 13 years this breach was healed and the two synods united under the title of the Synod of New York and Philadelphia, with more than 100 churches under its care.

At this time the tide of population was flowing rapidly westward. The frontier communities contained many men of lawless habits. Hostile Indians were numerous. The opposition of the state church added to the difficulties of the Presbyterian pioneer. Men of education and strength of character were needed. The church found them in the Tennents of New Jersey, Brainerd (the missionary to the Indians), Davies of Virginia, and many others whose work still lives in the Christian communities they established. In 1766, fearful of the legal establishment of the Church of England, the synod agreed to meet in annual convention with the General Assembly of Connecticut "to unite their endeavors and counsels for spreading the gospel and preserving the religious liberties of the church." This arrangement was continued till the War of 1776.

During all the struggle of the United States for independence the Presbyterians stood as one man for the defense of the civil and religious liberty of the country. John Witherspoon, one of its most prominent ministers, was a signer of the Declaration of Independence and before Congress made one of the most effective pleas for the liberty of our country. Although during the Revolutionary War many buildings were destroyed and congregations disbanded, still the vitality of the church continued, and when peace was restored it grew so rapidly that the need of a General Assembly became evident. In 1785 a large committee was appointed to consider a form of complete organization for the Presbyterian church in the United States. In May, 1788, the synod met and resolved itself into a General Assembly, which held its first meeting in Philadelphia the following year. The first Congress of the country was in session in New York at the same time. The first General Assembly embraced four synods (New York and New Jersey, Philadelphia, Virginia, and the Carolinas), 17 presbyteries, 419 congregations, and 180 ministers. This Assembly adopted the Westminster Confession of Faith after making changes in chapters 20, 23, and 31, and the Larger and Shorter catechisms. The form of government of the Scottish church was also adopted, but modified so as to deny to the civil magistrate any right of interference in church affairs, except for protection only.

In 1801 a plan of union was agreed upon between the Presbyterian church and the Connecticut General Association which provided terms for mutual help in the weaker communities. Presbyterian ministers might serve Congregational churches and vice versa.

The Presbyterian church, at the time of the union, numbered 26 presbyteries, 300 ministers, and nearly 500 congregations. Early in the century there were many revivals, especially in the southwestern part of the country, which brought into service many as catechists and exhorters who were neither highly educated nor firm believers in the peculiar doctrines of the Presbyterian church. The controversy over these questions brought about the secession of the Presbytery of Cumberland and resulted in 1810 in the formation of the Cumberland Presbyterian church (see below). The beginning of the nineteenth century showed increased zeal on the part of the Presbyterian church for missionary enterprise. Within a few years, in New York, Pennsylvania, and New England, missionary societies were formed to send the gospel to the Indians and among the pioneers. In 1802 the General Assembly organized a Standing Committee of Missions, consisting of 7 members, later increased to 19 members, whose duty it should be "to collect during the recess of the Assembly all the information in their power relative to the concerns of missions and missionaries," and to "superintend generally under the direction of the Assembly the missionary business." In 1816 the title of the committee was changed to Board of Missions, and it was authorized to act with a larger measure of independence. The growth of the church was rapid. In 1834 it contained 32 synods, 111 presbyteries, and about 1900 ministers. At this time signs of the future schism which divided the church for so many years into the Old and New schools became apparent. For some time there had existed a diversity of doctrinal beliefs among the ministers and churches. New doctrines, coming largely from New England, were adopted by the members of the New School party. In the Old School branch there was a leaning to the strict doctrine and discipline of the Scottish church; Albert Barnes (q.v.), of Philadelphia, and Lyman Beecher (q.v.), of Lane Seminary in Cincinnati, were both subjected to trial and censure by their presbyteries. The church was shaken by the controversy. The agitation over slavery divided it still further. The New School party felt called upon to denounce it, while the Old School thought that duty did not require that the church should pronounce on the subject. In 1837 the Assembly, having (for the first time in five years) a majority of Old School members, disowned or exscinded three of the synods of western New York and one in Ohio, with all the churches and ministers belonging to them. Great excitement prevailed throughout the church. A meeting of the excluded synods was held at Auburn, N. Y., in August, 1837, as the true constitutional Assembly, at which trustees were appointed for the care of the property of the corporation. These trustees later brought legal action to determine their rights, and a verdict was given in their favor, but on appeal to a higher court the decision was overruled on points of law and a new trial granted. The matter was not pressed further. In 1838 the New School members demanded enrollment for the excluded commissioners of the preceding year. This was refused, and the bodies separated, each claiming to have the constitutional succession and using the title the General Assembly of the Presbyterian Church in the United States of America. The Old School church had seminaries at Princeton, N. J., Allegheny, Pa., Columbia, S. C., Danville, Ky., and Chicago. The New School seminaries were Union, N. Y., Auburn, N. Y., Lane at Cincinnati, and Blackburn, Ill. Each church carried on its work with great zeal, both at home and abroad; each branch was active in encouraging educational institutions, and, as they flourished side by side, each grew more confident of the orthodoxy and usefulness of the other. The Old School Assembly of 1837 had organized its Board of Foreign Missions, and it continued to support the boards of Home Missions and of Education which had been organized before the division. The New School carried on its home mission work through the American Home Missionary Society. Later, however, it organized permanent committees on home missions, education, and publication, through which its work was carried on, while its foreign work was conducted through the American Board of Commissioners for Foreign Missions.

But now signs of the approaching national storm began to appear. In 1858 the southern part of the New School church dropped off and organized under the title of the United Synod of the Presbyterian Church, South. A hundred ministers and 200 churches constituted this synod, which remained a separate organization until 1864, when it joined the General Assembly of the Southern Presbyterian Church. In 1861 the Old School branch suffered a similar defection, as the Assembly of that year took action which grieved the Southern commissioners, who withdrew and organized the Southern Presbyterian church, under the title of the Presbyterian Church in the United States (see below). With the abolition of slavery and the close of the Civil War a new spirit arose in the two branches of the church in the North. The New School had proved its soundness in the faith. In 1866 the two Assemblies met in St. Louis and for the first time in a generation partook of the Lord's Supper together. A committee was appointed to consider plans for union, these plans were submitted to the various presbyteries, and in 1869 the two assemblies met and paved the way for the union which was consummated in November, 1869, in Pittsburgh. The next year both assemblies met in the First Church of Philadelphia as one body. At this time the ministers numbered 4238, the churches 4526, and the members 446,561. In 1888 the General Assembly celebrated in the city of Philadelphia the first century of its organization. In 1788, at the time of the first Assembly, there were but 419 churches and not more than 20,000 communicants. At the centennial there were 6436 churches reported and about 700,000 communicants.

In 1889 the General Assembly received overtures from a number of presbyteries asking for some revision of the doctrinal standards. In reply that Assembly sent overtures to all the presbyteries asking whether revision were desired and to what extent. About two-thirds of the presbyteries expressed a desire for revision, and the Assembly of 1890 appointed a committee on revision, consisting of 15 ministers and 10 ruling elders. This committee presented a report in 1892 recommending sundry changes in the Confession of Faith, but the overtures from the Assembly failed of the constitutional majority, and revision was for the time abandoned. The demand for some modification of the Confession continued and by 1900 had become so general that the Assembly of that year appointed another committee of 15 to consider the whole question of a restatement of doctrine. It reported progress in 1901, was enlarged and continued with instructions to report the next year. At the Assembly of 1902 in the city of New York a unanimous report was made. The committee recommended that additional statements concerning the love of God for all men, missions, and the Holy Spirit be added in the form of new chapters to the Confession of Faith. The committee also presented a brief statement of the Reformed Faith in 16 articles, which was designed not to take the place of the Confession of Faith as a doctrinal standard of the Presbyterian church, but to be an interpretation of it. This "Brief Statement of the Reformed Faith" was adopted with only two dissenting voices.

The great national expansion following the War with Spain in 1898 gave a marked advance to the missionary operations of the church. The field of home missions, which already extended to Alaska, was widened to include Porto Rico and, later, Cuba, while in the Pacific the Philippine Islands were added to the vast foreign missionary territory.

This enlarged work for the church was naturally followed by a tendency towards the strengthening and unification of church forces. In 1903 the assemblies of the Presbyterian church in the United States of America and of the Cumberland church appointed committees to consider the question of union between these two bodies. Plans presented by these committees were considered by their respective assemblies in 1904 and 1905 and submitted to the various presbyteries, by whose vote the union was approved. This union was declared at the assemblies of 1906 and consummated in 1907, when the two churches, for the first time in 97 years, held their annual Assembly together. Since this union there has been marked progress both in membership, which now numbers more than a million and a half, and in the gifts for church support and missions, which in 1915 reached the grand total of $27,784,000.

Presbyterian academies and colleges are found in all the States, while twelve theological seminaries which are under the care of the Assembly provide for the church an educated ministry. They are as follows: Princeton Theological Seminary, at Princeton, N. J. (founded 1812); Auburn Theological Seminary, at Auburn, N. Y. (1820); Western Theological Seminary, at Allegheny, Pa. (1827); Lane Theological Seminary, at Cincinnati (1832); McCormick Theological Seminary, at Chicago (under General Assembly, 1859); Danville Theological Seminary, at Danville, Ky. (1859), which has been consolidated with the Louisville Theological Seminary of the Southern church and is now styled the Theological Seminary of Kentucky; San Francisco Theological Seminary, at San Anselmo, Cal. (1871); the Theological Seminary at Omaha, Neb. (1891); and two German theological seminaries—at Bloomfield, N. J. (1869), and at Dubuque, Iowa (1852). There is also a theological department in connection with Biddle University for Freedmen, established in 1868, and with Lincoln University at Oxford, Pa., established in 1871; both of these are supplying ministers for the colored population. For further details, see the separate articles on the more important of the institutions named above.

Presbyterian Church in the United States. In May, 1861, the General Assembly, meeting in Philadelphia, adopted a paper in reference to the Civil War, which asserted the loyalty of the church to the Union and promised the support of all its churches and ministers to the Federal government. The Southern Presbyterians, feeling that the church had exceeded her rights in pronouncing on a political question, "concluded that a separation from the General Assembly aforesaid was imperatively demanded. Not in the spirit of schism, but for the sake of peace and for the protection of the liberty with which Christ had made them free." Accordingly the representatives of 47 presbyteries commissioned for that purpose met in Augusta, Ga., on Dec. 4, 1861, and organized a new Assembly, designated as the Presbyterian Church in the Confederate States of America. After the war, however, the word "United" was substituted for "Confederate," and "of America" was dropped. The Southern Presbyterian church disavows all connection with political matters and emphasizes its purely ecclesiastical mission. At the time of its organization the Southern church included 10 synods, 47 presbyteries, about 700 ministers, and 75,000 communicants, of whom 10,000 were of the African race. The missionary work of the church is conducted by permanent committees and is carried on in many foreign lands as well as in the United States. The interests of publication and colored evangelization are also conducted by efficient committees. This church in 1915 had a membership of 332,339. During the church year 1914–15 it made a net gain of 7 per cent. Its contributions the same year for all purposes were $4,792,860. The standards of the church are: the Westminster Confession of Faith, the Larger and Shorter catechisms, the Form of Government and Directory for Worship, somewhat altered to suit the circumstances of the church. Every church officer is required to adopt them.

This church has theological seminaries at Richmond, Va. (Union Theological Seminary), and Columbia, S. C. (Columbia Theological Seminary). The seminary at Louisville and Danville Seminary have been united, and the seminary is now at Louisville, Ky. There are also theological departments in connection with the University of Texas and the Southwestern Presbyterian University at Clarksville, Tenn., and, for negroes, Stillman Institute, Tuscaloosa, Ala.

Cumberland Presbyterian Church. This body was organized in Tennessee on Feb. 14, 1810, by three Presbyterian ministers, Finis Ewing, Samuel King, and Samuel McAdow. They called the organization the Cumberland Presbytery. This act was the crisis of a movement begun a dozen years earlier, the great spiritual revival which had stirred that part of the Southwest, under the leadership of James McGready and others. This revival was widespread, and its converts were so many that the demand for ministers was far in excess of the number the church could furnish. Under the advice of some of the most honored ministers of the time, men of approved intelligence and religious character were chosen as exhorters, even though they had not had the education usual to candidates for the ministry. The urgency of the need seemed to the revival party a sufficient reason for the custom. The men so ordained were permitted to adopt the Westminster Confession of Faith with the exception of "the idea of fatality." The controversy along these two lines increased till it resulted in the formation of the new church. In 1813 the Cumberland Presbytery had so increased as to make necessary its division into three presbyteries and the formation of a synod. One of its first acts was to appoint a committee to prepare a Confession of Faith. In 1869 the colored people asked and received consent of the General Assembly to the organization of the African Cumberland Presbyterian church. For the reunion of the Cumberland church with the Presbyterian church in the United States of America, see the *Presbyterian Church in the United States of America,* above. The growth and statistics of the Cumberland church at the time of the consummation of this union are shown in the table on page 183.

United Presbyterian Church of North America. This body was organized in Pittsburgh, Pa., on May 26, 1858, by a union of the Associate and the Associate Reformed churches. By one line the United Presbyterian church is descended from the Covenanters of Scotland, by the other line it is descended from a body of men who were imbued with the ideas which later brought forth the Free church of Scotland. The basis of the union was the Westminster Standards together with a Testimony. The Testimony consists of 18 articles designed to set forth the views of the church on "certain points not distinctly introduced into the Confession of Faith." The church holds to a restricted communion; it has been and still is distinguished by its attitude on the subject of church psalmody, using only the Psalms for its worship of song. In 1881 the General Assembly by a very small majority repealed the rule forbidding the use of instrumental music in the worship of God. The United Presbyterian church has always maintained a high standard for the ministry. As early as 1794 the Associate church established a theological seminary in Pennsylvania, the first on the continent. Other seminaries and colleges have been founded. Home and foreign mission work has prospered as well as freedmen's work, publication, and ministerial relief. At the union, in 1858, there were 408 ministers, and the contributions were $253,150 for all purposes. The United Presbyterian church has two theological seminaries—one at Allegheny, Pa., founded in 1825; and one at Xenia, Ohio, founded by the Associate Synod in 1794 at Service, Pa., removed to Canonsburg in 1821, and to Xenia, Ohio, in 1825.

Reformed Presbyterian Synod. This body was founded in 1743 by members of the Covenanting or Reformed Presbyterian church of Scotland. In 1798 a presbytery was organized in Philadelphia. In 1800 it enacted a law that no slaveholder should be a communicant, a position always maintained. Members of this church neither vote at political elections, enlist in the army, nor serve on juries. In 1833 the questions relating to the extent of severance between church and state led to the disruption of the church, the General Synod of the Reformed Presbyterian Church being formed of those who, while adhering to the Standards, permitted their members to discharge the duties of citizens. This body has a theological seminary at Philadelphia, founded in 1807. The Reformed Presbyterian church (Covenanter) has a theological seminary at Allegheny City, Pa.

	Presbyteries	Ministers	Churches	Church members	Sunday-school members	Home work	Foreign work
Presbyterian church in U. S. A.	292	9,685	9,996	1,513,240	1,375,875	2,884,818	2,256,334
Presbyterian church in U. S. (South)	85	1,850	3,438	332,339	310,278	800,981	544,162
United Presbyterian church of N. America	75	1,151	1,136	192,028	196,500	No definite returns	
Cumberland Presbyterian church	22	950	1,445	55,000	40,000		
Reformed Presbyterian Church General Synod	5	24	20	2,500	1,500		
Welsh Presbyterian, or Calvinistic Methodist	12	112	91	15,000	12.000		
Associate Reformed Synod of the South	9	115	158	14.036	9,437		
Reformed Presbyterian Church Synod	11	134	114	9,315	9,779		
Presbyterian church in Canada	73	1,787	2,325	314,832	252,300		

Associate Reformed Presbyterian Synod of the South. This body was organized in 1803 at Brick Church, Fairfield Co., S. C. Until 1822 it was connected with the General Synod, composed of the synods of New York and the West. But the General Synod always met in New York, and, as the Southern men could so seldom attend, it was decided in 1822 to become an independent synod. The separation was not on account of slavery or sectionalism. It has churches in every Southern State and flourishing mission work in Mexico. Its educational institutions are Erskine College, Erskine Theological Seminary, and Due West Female College, all located at Due West, S. C.

	Presbyteries	Church members	Sunday-school members
Church of Scotland	84	713,782	225,465
United Free church of Scotland	65	507,675	229,292
Free church of Scotland	13	8,000	6,674
Presbyterian church of England	12	86,848	93,361
Presbyterian church in Ireland	36	104,569	91,477
Reformed Presbyterian Synod, Ireland	4	4,000	741
Calvinistic Methodist or Presbyterian church of Wales	25	183,647	213,857

Associate Synod of North America. This is a small body which declined to enter the union which in 1858 constituted the United Presbyterian church. It has 12 ministers and about 1000 members and coöperates with the original Seceders of Scotland in mission work in India.

In 1875 the first step was taken towards a closer affiliation of Presbyterian churches in the organization in London of the Alliance of Reformed churches holding the Presbyterian system. The object is to promote fellowship among all branches of Presbyterianism. The American section of the alliance represents over 2,000,000 communicants. Seven denominations unite in it, viz., the Reformed church in America, the Presbyterian church in the United States of America, the Presbyterian church in the United States, the Reformed church in the United States, the United Presbyterian church, the Associated Reformed Presbyterian Synod, and the Cumberland Presbyterian church (colored). The alliance meets biennially.

Statistics. The accompanying tables give the latest available figures for the different Presbyterian churches.

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PRES′BYTERY (ML. *presbyterium*, from Gk. πρεσβυτέριον, assembly of elders, from πρεσβύτερος, *presbyteros*, elder). Generally, the body or class of presbyters or elders in the Christian churches taken collectively. More specifically, in the churches having a Presbyterian form of government, it is one of a series of judicatories, ranking next above the session, which is the court of a local church, and below the synod (q.v.). The presbytery as an ecclesiastical judicatory is most completely developed in the Presbyterian church in the United States of America, where its composition and powers are defined in the Form of Government as follows: "A presbytery consists of all ministers, and one ruling elder for each congregation, within a certain district. The presbytery has power to receive and issue appeals from church sessions, and references brought before them in an orderly manner; to examine and license candidates for the holy ministry; to ordain, install, remove and judge ministers; to examine and approve or censure the records of church sessions; to resolve questions of doctrine or discipline seriously or reasonably proposed; to condemn erroneous opinions which injure the purity or peace of the Church; to visit particular churches for the purpose of inquiring into their state and redressing the evils that may have arisen in them; to unite or divide congregations, at the request of the people, or to form and receive new congregations; and in general to order whatever pertains to the spiritual welfare of the churches under their care." Such a presbytery corresponds to a classis in the Reformed churches. The name "presbytery" is also commonly applied in the Roman Catholic church to the pastoral residence of the priest or priests of a parish.

PRESBYTERY. The space in the choir of a church in which the high altar is placed; the name is sometimes extended to the whole choir, but is usually applied to the part inclosed by the choir stalls in mediæval churches.

PRES'COTT. A town and the county seat of Grenville County, Ontario, Canada, on the St. Lawrence River and the Canadian Pacific and Grand Trunk railways, 50 miles south of Ottawa (Map: Ontario, K 4). The town possesses county buildings, a public library, and government marine works. Industrial establishments include a distillery, creamery, grain elevator, planing mill, brewery, and manufactories of emery wheels, caskets, veneer paper, etc. Pop., 1901, 3019; 1911, 2801.

PRESCOTT. A city, the former capital of the Territory of Arizona and the county seat of Yavapai County, 134 miles by rail north of Phœnix, on the Santa Fe, Prescott, and Phœnix and the Atchison, Topeka, and Santa Fe railroads (Map: Arizona, C 3). It contains the Pioneers' Home, a unique institution, which cares for all pioneers of 25 years' residence, both men and women; St. Joseph's Academy, Mercy Hospital, a Carnegie library, and a handsome courthouse. The city is 5347 feet above the sea, in a rich gold, copper, and silver country. Stockraising and farming are carried on extensively. Pop., 1900, 3559; 1910, 5092.

PRESCOTT. A city and the county seat of Nevada Co., Ark., 31 miles southwest of Arkadelphia, on the Prescott and Northwestern, and the St. Louis, Iron Mountain, and Southern railroads (Map: Arkansas, B 4). It has an important cotton and peach trade, and ships also lumber, live stock, wool, furs, chickens, turkeys, eggs, butter, peanuts, cotton seed, etc. Pop., 1910, 2705.

PRESCOTT, ALBERT BENJAMIN (1832–1905). An American chemist, born at Hastings, N. Y. He graduated in medicine at the University of Michigan in 1864, and was made assistant professor of chemistry there in 1865, professor of organic and applied chemistry in 1870, dean of the school of pharmacy in 1876, and director of the chemical laboratory in 1884. Prescott served as president of the American Chemical Society in 1886, of the American Association for the Advancement of Science in 1891, and of the American Pharmaceutical Association in 1900. He wrote: *Qualitative Chemical Analysis* (1874; 5th ed., 1901); *Chemistry of Alcoholic Liquors* (1875); *Outlines of Proximate Organic Analysis* (1875; 2d ed., 1877); *First Book in Qualitative Chemistry* (1879; 11th ed., 1902); *Organic Analysis* (1887; 2d ed., 1889).

PRESCOTT, GEORGE BARTLETT (1830–94). An American electrical engineer, born at Kingston, N. H. He learned telegraphy soon after the system had been put into practical use, by 1858 had become superintendent of the lines of the American Telegraph Company and by 1866 superintendent for the Western Union Company; from 1873 until 1880 was electrician of the International Ocean Telegraph Company; was one of the early promoters of the telephone; and was connected with numerous telegraph and telephone companies. In 1852 he discovered that the aurora borealis is an electric phenomenon. He invented an improvement in telegraph insulators in 1872; with Thomas A. Edison invented and introduced the duplex telegraph and the quadruplex telegraph; and also introduced from Europe, which he visited in 1873, the system of sending messages in pneumatic tubes. He published: *History, Theory, and Practice of the Electric Telegraph* (1860); *Electricity and the Electric Telegraph* (1877); *The Speaking Telephone* (1878); *Dynamo-Electricity* (1884); *Bell's Electric Speaking Telephone* (1884); and *The Electric Telephone* (1890).

PRESCOTT, OLIVER (1731–1804). An American soldier, born at Groton, Mass. He graduated at Harvard in 1750, practiced medicine, and became brigadier general of militia for the County of Middlesex and a member of the Board of War in 1776. From 1777 to 1780 he was a member of the Massachusetts Supreme Executive Council, in 1779 was made judge of probate for the County of Middlesex, and in 1781 was promoted to the rank of second major general of State militia. In 1786–87 he took a prominent part in the suppression of Shays's Rebellion (q.v.).

PRESCOTT, WILLIAM (1726–95). An American soldier, born at Groton, Mass. In 1755 he served with distinction as lieutenant and captain under Gen. John Winslow (q.v.). After the battle of Lexington he organized a regiment of minutemen and marched as its colonel to Cambridge. On June 16, ordered to Charlestown, he threw up intrenchments at Breed's Hill, near Bunker Hill. In the next day's battle, during which he is generally considered to have been the Patriot commander, he displayed great bravery, and was the last to leave the field. After serving about two years longer he returned to his farm, but again served as a volunteer for a short time at Saratoga in 1777. He was subsequently a member of the Massachusetts Legislature for several years. Consult S. A. Green, *Colonel William Prescott and Groton Soldiers in the Battle of Bunker Hill* (Boston, 1909).

PRESCOTT, WILLIAM HICKLING (1796–1859). An American historian. He was the son of a distinguished lawyer and statesman and grandson of Col. William Prescott, and was born at

Boston, May 4, 1796. He entered Harvard College in 1811 as a sophomore, and graduated in 1814. While there he lost the sight of one eye by an accident, and the other was so affected that he had to pass several months in a darkened room. He partly recovered the sight of it, but he could use it only a little each day and never in any difficult work. He entered his father's law office, but in January, 1815, the injured eye became inflamed and refused to yield to remedies; so it was determined in the autumn that he should seek health by wintering at St. Michael's and get medical advice in the spring. At the Azores, where he often had to live in a darkened room, he acquired the accomplishment of learning almost by heart long passages which he had thought out and which he meant to have written. Physicians told him that the sight was hopelessly gone from one eye and that the preservation of the other depended on his health. Prescott now returned to Boston, after a sojourn in Europe, and on May 4, 1820, married Miss Susan Amory. A legal career was, of course, out of the question, but Prescott's family were well off; so his half blindness was not made still more cruel by the trammels of poverty. He determined, despite the special difficulties in his case, to devote himself to a literary career. His reading of Gibbon's autobiography increased his passion for historical writing. After studying extensively for years in English, French, German, Italian, and Spanish literature and history and after considering many plans for historical works, he finally, in 1826, chose the Spanish field for his labors.

Owing to his bad eyesight he was obliged to have the aid of readers and secretaries, and for his own writing had recourse to a writing frame designed especially for the blind. After eight years of hard labor he produced the first results of his research, the *History of the Reign of Ferdinand and Isabella the Catholic* (3 vols., dated 1837, though published 1838). The work at once gained favor, and was soon translated into French, Spanish, and German. He then spent six years on what is probably his most brilliant work, a *History of the Conquest of Mexico, with a Preliminary View of the Ancient Mexican Civilization, and the Life of the Conqueror, Hernando Cortés* (3 vols., 1843). His third work in the series was the *History of the Conquest of Peru, with a Preliminary View of the Civilization of the Incas* (3 vols., 1847). These greatly added to his reputation. He was made corresponding member of the French Institute, and on his visit to Europe in 1850 was received with honor. In 1855 appeared two volumes of the *History of the Reign of Philip the Second, King of Spain,* and in 1858 the third volume, but the work was cut short by a stroke of apoplexy. He had, however, added to his series by editing Robertson's *History of the Reign of Charles the Fifth* (3 vols., 1857), adding thereto a supplement, the third volume, embracing the life of the Emperor after his abdication. On Jan. 27, 1859, he succumbed to a second stroke of apoplexy. Aside from his histories his literary work consists of a preface to Madame Calderon de la Barca's *Life in Mexico* (2 vols., 1843); *Biographical and Critical Miscellanies* (1845); "A Memoir of the Honorable John Pickering," in vol. x of *Collections of the Massachusetts Historical Society,* 3d series; and a *Memoir of the Honorable Abbott Lawrence* (1856). An edition of his works (16 vols., ed. by J. F. Kirk, 1870) is very satisfactory. There is also a more recent 20-volume edition (Philadelphia, 1906).

Prescott is eminent in American letters as one of the first and most accomplished of the historians. Slightly younger than Irving and later in acquiring literary reputation, he excelled him in the extent and system with which he treated his work. To him, with Irving in history and romance, Ticknor in Spanish literary research, and Motley, a few years later, in history, belongs the honor of having introduced and made popular to the English-speaking and a good part of the foreign world the story of the Spanish nation. Technically, as an historian, Prescott has been justly criticized for a tendency to color his pictures too highly and to allow his admiration for his heroes to get the better of his judgment; nor is he altogether successful in dealing with political complications. His most serious defect is one for which he cannot fairly be held responsible. American archæology has been revolutionized since his day by the labors of Morgan, Bandelier, and others, and the more or less romantic and distorted pictures of Mexican and Peruvian development given by the Spanish chroniclers on whom Prescott relied have been corrected. Thus his work needs to be read in the light of modern research and to be corrected at various points, but with the proper allowance and viewed as literature its high rank seems assured. His style is dignified, refined, and always eminently readable, and his histories have truly become household classics. Consult: George Ticknor, *Life of William Hickling Prescott* (Boston, 1864); Theodore Parker, "Prescott as an Historian," in *The American Scholar* (new ed., ib., 1907); also lives by Rollo Ogden (ib., 1904), and H. T. Peck (New York, 1905).

PRESCRIP'TION (Lat. *præscriptio,* from *præscribere,* to prescribe, from *præ,* before + *scribere,* to write). A formula by which the physician directs the compounding and dispensing of medicines. Prescriptions were formerly written entirely in Latin, the common scientific language; but at the present time and in the United States the tendency is to restrict the employment of Latin to the names of the ingredients of the formula, English being used for the directions. Since the botanical or chemical names are the only ones by which vegetable or mineral drugs can be definitely known, Latin is retained for this part of the medical formula. The formal prescription consists of four parts: 1. The superscription comprises the name of the patient, date, and the sign ℞. The latter is now used as an abbreviation of the Latin word *recipe* (take); although the derivation of the sign is obscure, the symbol was formerly thought to stand for Jupiter. 2. The inscription or body of the formula consists of the names and quantities of the drugs to be compounded. The names of the ingredients, as before stated, are written in abbreviated Latin, and the quantities set down in apothecaries' measure or according to the metric system. 3. The subscription is made up of directions to the apothecary. 4. The signature (Lat. *signetur,* let it be labeled) consists of directions to the patient—dose, time, and method of taking. This is followed by the physician's signature or initials. Consult: M. D. Mann, *Manual of Prescription Writing* (6th ed., New York, 1907); A. H. Prichard, *Practical Prescribing, with Clinical Notes* (Oxford, 1914); J. M. Swan, *Prescription Writing and Formulary* (Philadelphia, 1915); Osborne, *Handbook of Therapy* (Chicago, 1915).

PRESCRIPTION. In Roman legal procedure, a prescription was a plea which the prætor placed at the beginning of the instruction (*formula*) which he sent to the referee (*judex*) in order that it might be examined before all other disputed issues. The prescription of long time was one of the most important of the Roman prescriptions; and in mediæval procedure the word "prescription" was used only to designate such a plea. In the broadest sense, prescription means the legalizing of an existing state of things in consequence of lapse of time—the establishment of legal rights by the prolonged exercise of corresponding powers and the extinction of rights by prolonged failure to use the powers which they are supposed to confer. In early law the field of prescription is practically unlimited. In highly developed law no substantive rights are acquired or lost by prescription except rights in things. Remedial rights, or rights of action, however, are regularly lost by nonuser.

Civilians divide prescription into acquisitive, by which rights are created, and extinctive, by which they are destroyed. For the prescription of actions the English law employs the term "limitation." See LIMITATION OF ACTIONS.

Roman Law. *Prescription of Rights in Things.*—According to the Twelve Tables, movables (except stolen things) were acquired "by use" (*usucapio*) in one year, immovables in two. In the later Republic the prætors and provincial governors developed for provincial real estate a "prescription of long time." Justinian fused the two institutions, limiting the term "usucapion" to movables and "prescription" to immovables. Under the rules which he laid down the person who acquired possession in good faith and who maintained uninterrupted possession for a certain period became owner. The period, in the case of movables, was 3 years; in the case of immovables, if the owner lived in the same province, it was 10 years; if he lived in another province, it was 20 years. Public and ecclesiastical property was excluded from this ordinary prescription; also all property of which the owner had been dispossessed by theft or violence, although it had subsequently come into the hands of an honest possessor.

Justinian further enacted that when the owner's action of recovery was extinguished by prescription, the possessor, if he had acquired possession in good faith, should become owner. Property excluded from the ordinary prescription was in most instances capable of being acquired by this *præscriptio longissimi temporis* (30 or 40 years).

Prescription of Actions.—At early Roman law rights of action, as such, were perpetual; they ceased to exist only when the substantive right was lost (as by usucapion). The equitable actions given by the prætors, however, were limited, and Imperial legislation finally limited all actions. The periods varied from 6 months to 40 years; the ordinary period was 30 years.

Acquisitive prescription and the prescription of actions were regularly suspended in the case of persons unable to exercise their rights, e.g., persons under household authority and infants.

Immemorial Prescription.—A survival from early law, when prescription had a wider range, is found in the rule that any state of things which has existed so long that no memory remains of its origin is presumed to have been legally established. The Roman jurists, however, invoked this rule only to protect public use of private property—e.g., rights of way and artificial watercourses—and to prevent interference with ancient dikes and channels regulating the flow of surface water.

Modern Civil Codes. Prescription has lost much of its importance by reason of changes in the law of property. The general retention or adoption of the old German rule that honest acquisition of movables gives title has left no room for prescription of movables except as regards lost or stolen things. In these cases the honest possessor apparently becomes owner when the former owner's action of recovery is extinguished, which occurs in periods varying from 2 to 10 years. As regards real property, the importance of prescription has been greatly lessened by official registration of titles and the indisposition of the law to recognize other than registered rights. Consult authorities cited under CIVIL LAW; also Unterholzner, *Verjährungslehre* (2d ed., Liepzig, 1858), and Grawein, *Verjährung und gesetzliche Befristung* (1880).

English and American Law. In the common-law system prescription is employed in a narrower sense than in the legal systems derived from the Roman law, being restricted to the acquisition of the interests in land described as incorporeal, such as easements and profits *à prendre*, the acquirement of title to personal property and to corporeal interests in land by lapse of time being comprehended under the heads of ADVERSE POSSESSION and LIMITATION OF ACTIONS (qq.v.). The common-law theory of the effect of prescription is also radically different from that of the civil law, as its operation is not to sanction a wrongful possession, but to furnish evidence, more or less conclusive, of the lawful origin of the right claimed. This theory in English law took on the grotesque form of the doctrine of a lost grant, the open and notorious enjoyment of the right claimed without interruption for the prescriptive period raising a presumption that it was originally conferred by deed from the owner of the land affected, the tender of the deed in court being excused by the further fiction of its loss. This presumption may still be rebutted by showing that the alleged grantor could not possibly have made the grant in question, but in England (where prescriptions are now mainly governed by statute), as well as in the United States (where they are still regulated by the common law), the fiction of a lost grant has now generally been abandoned and the whole doctrine placed on a more rational basis by being assimilated to the principles governing adverse possession of lands. The latter, however, still retain many of the peculiarities derived from the feudal doctrines of seisin and disseisin (qq.v.), the legal title of the adverse holder of land being in theory based, not on the length of his possession, but upon his seisin, however wrongful this may have been—the lapse of time operating only to quiet the title thus obtained.

The period of prescription has varied from the immemorial enjoyment of the earlier common law (interpreted to signify an uninterrupted user from the accession of Richard I, 1189) to the modern period, which, by analogy to the limitation of real actions by statute, is usually fixed at 20 years. As in the case of limitation, also, the prescriptive term will not begin to run during the existence of a legal disability, as infancy, insanity, or coverture, in the owner of the land over which the right in question is asserted, nor if the land is at the time of the adverse user in the possession of a tenant or disseisor. An easement or profit once acquired, however, against the tenant in fee simple binds the land into whosesoever hands it may thereafter come.

The operation of the principle of prescription is further restricted by limiting it to rights of enjoyment of a common and well-known sort and, in the United States, to such as answer the description of positive or affirmative as distinguished from negative rights. Thus, while rights of way, of drainage, and the like may be gained by prescription everywhere, the negative easements of light and of lateral support cannot generally be acquired in this way in the United States, although in England no such distinction is recognized. But new and unusual incidents of ownership resting on prescription—such, e.g., as the right to the access of air to a windmill or the right to a fine view—will not be admitted even in Great Britain. Such rights, as well as the negative easements, in the United States arise only by grant.

Strictly speaking, prescriptive rights, as the expression is used in English law, are to be further distinguished from public or quasi-public rights in the nature of easements or profits, such as commons appendant, customary rights of way, and the like, even when these rest, as they commonly do, on immemorial enjoyment. The distinction rests on the fact that prescription in legal theory always presumes a grant; and if the right in question is claimed by an indefinite number of people, as in the case of a custom, it cannot rest on a grant, and is therefore not strictly prescriptive in character. Consult Emory Washburn, *Treatise on the American Law of Easements and Servitudes* (4th ed., Boston, 1885); T. A. Herbert, *History of the Law of Prescription in England* (New York, 1891); C. J. Gale, *Treatise on the Law of Easements* (8th ed., Toronto, 1908).

PRESENTATION AT COURT. See COURT, PRESENTATION AT.

PRESENT'MENT (OF. *presentment*, *presentement*, from *presenter*, to present, from Lat. *præsentare*, to set before, from *præsens*, pres. p. of *præesse*, to be at hand, from *præ*, before + *esse*, to be). An informal accusation by a grand jury as to a crime coming to its notice, and afterward reduced to the form of an indictment. It is usually the result of an investigation conducted before it or based upon information as to a crime communicated to it by some one while it is in session. A presentment differs from an indictment in that the latter is found by indorsing the words "a true bill" on a formal bill of indictment prepared and laid before the grand jury by a prosecuting officer. The words "presentment" and "indictment" are frequently used as being interchangeable, but this is not sanctioned by the best authorities. See GRAND JURY; INDICTMENT.

Presentment also has a special meaning in the law of negotiable paper, as describing the offering of a bill of exchange for acceptance or a formal demand of payment. See BILL OF EXCHANGE; NEGOTIABLE INSTRUMENTS.

PRESERVATION OF FOOD. See FOOD, PRESERVATION OF.

PRESERVES. See GAME PRESERVES.

PRESIDENT (OF. *president*, Fr. *président*, from Lat. *præsidens*, president, pres. p. of *præsidere*, to preside, direct, sit before, from *præ*, before + *sedere*, to sit). The chief executive officer of the United States government, chosen for a term of four years by an electoral college. In case of removal, resignation, death, or inability to discharge the duties imposed by the Constitution and laws he is succeeded by an officer called Vice President. The electors by whom the President is chosen are appointed in each State in such manner as the Legislature thereof may direct, each State being entitled to as many electors as it has Senators and Representatives in Congress. At present the practice is to choose the electors by popular vote on a general ticket. This election takes place on the Tuesday following the first Monday in November of the year preceding that of the new presidential term. These electors assemble in their respective State capitals on the second Monday of January following for the purpose of casting their votes, which are in turn transmitted to Congress and officially counted by that body on the second Wednesday of February. In case no candidate receives a majority of the electoral votes the election is taken to the House of Representatives, where the members voting by States choose a President from the three highest candidates on the list. This happened in 1800 and again in 1824. The President is inaugurated on the 4th of March following the election. He is eligible for reëlection without limit as to the number of terms, but the precedent set by Washington of refusing a third term has never been broken. Nine Presidents have been elected for a second term. The convention which framed the Constitution of the United States was well-nigh unanimous in opinion as to what should be the character of the presidential office, although there were differences of opinion as to what should be the tenure and mode of election. The State governors and presidents afforded a tolerably clear model for the creation of the national executive, and it may be said that these were followed rather than the British executive. The qualifications for the presidency are fixed by the Constitution; they are citizenship acquired by birth in the United States, 14 years' residence in the United States, and the completion of the thirty-fifth year of age. Before entering upon the discharge of his duties the President is required to swear or affirm that he will faithfully execute the duties of the office to which he has been elected and to the best of his ability preserve, protect, and defend the Constitution of the United States. On the occasion of the inauguration the President delivers a public address in which he announces his political policy, and annually upon the meeting of Congress he sends a message to that body containing information of the state of the Union and making such recommendations as may seem to him wise and expedient. The President may also send special messages to Congress for the purpose of urging important matters upon their attention.

The President receives compensation for his services in a salary which since 1909 has been fixed by statute at $75,000 per year, and which cannot be increased or diminished during his term. He is also allowed the use of the executive mansion, with the furniture and effects kept therein, and $25,000 for expenses of travel. He is prohibited by the Constitution from accepting any other emolument from any one of the commonwealths or from any foreign prince, king, or state. He is privileged from the jurisdiction of any court or magistrate, but may be impeached by the House of Representatives for treason, bribery, or other high crimes and misdemeanors, and upon conviction by the Senate must be removed from office. Being then divested of his official character, he is subject to indictment and trial in the regular courts as any other private individual. The privilege of resigning from office is recognized by the Constitution, and the formalities of relinquishment are prescribed by a statute of Congress.

The powers and duties of the President include the management of the foreign relations of the United States; the calling together of Congress in extraordinary session and the furnishing it with information concerning the government; the power to veto legislative measures; the command of the army and navy; the granting of reprieves and pardons; the execution of the laws; and the appointment of the officers of the United States. See United States; and for the electoral votes cast for the various candidates for the presidency and the vice presidency, see Electoral Votes. See also Electoral College. Consult: Edward Stanwood, *History of the Presidency* (2 vols., Boston, 1903–12); Gardiner, *Constitutional Powers of the President* (New York, 1905); Bryce, *The American Commonwealth*, vol. i (ib., 1910); Grover Cleveland, *Independence of the Executive* (Princeton, N. J., 1913).

PRESIDIO, prȧ-sē′dyȯ; *often Anglicized*, prė-sĭd′ĭ-ō (Sp., garrison, guard). There are two military reservations in the United States designated presidio—the Presidio of San Francisco and the Presidio of Monterey, both in California. The Presidio of San Francisco is a military reservation of 1479.94 acres, situated in the northwest suburbs of San Francisco, on the southern margin of the harbor of San Francisco. It was established early as a military post by the Spanish, and was continued by Mexico, when it succeeded Spain and by the United States after the cession of the territory by treaty. It was reserved for military purposes by executive order dated Nov. 6, 1850, afterward modified by executive order dated Dec. 31, 1851. The post office, Presidio Station, San Francisco, Cal., is 5 miles from the city. A street railway connects them. The usual garrison is one regiment of infantry. The Letterman General Hospital is an adjunct of the post.

The Presidio of Monterey is a military reservation of 398.13 acres, partly situated within the city limits of Monterey, Cal., overlooking the bay. It was occupied as a military post by the Spanish government as early as 1772, and eventually the United States obtained title. By executive order dated Nov. 23, 1866, the reservation included only 158.14 acres, but it was enlarged in 1903 and in 1906. The usual garrison is a regiment of cavalry, besides which there are a field hospital and an ambulance company. Consult *Military Reservations* (rev. ed., Washington, 1910).

PRESQUE ISLE, prĕsk′ īl′. A town in Aroostook Co., Me., 42 miles north by west of Houlton, on the Bangor and Aroostook and the Canadian Pacific railroads (Map: Maine, E 2). It contains a hospital, a public library, and an opera house, and enjoys some popularity as a summer resort. There are farming and lumbering interests and some manufactories. Pop., 1900, 3804; 1910, 5179.

PRESS. See Dies and Die Sinking; Hydraulic Press; Machinery; Metal-Working Machinery; Printing.

PRESS, Freedom of the. The immunity of the printing press from responsibility to the government for the character of the matter which it publishes except in the case of matter deemed libelous. (See Libel.) In the early history of the printing press no such immunity was recognized, and it became an established rule that a free press was wholly incompatible with an absolute government. The censorship of the press originated in the attitude of the Roman Catholic church, which in 1515 formally decreed through the Council of the Lateran that no publication should be issued from any place over which the church had jurisdiction without the written sanction of the Bishop or of the Inquisitor of the diocese. The institution of the censorship gradually became a feature of the policy of the civil authorities in the various states of continental Europe, from some of which it has not yet disappeared. At present no censorship exists in France, Switzerland, Sweden, Spain, Italy, Norway, the Netherlands, Belgium, Denmark, and Germany, but the press laws are very rigid in some of these, such as Spain, France, and Germany, and their governments claim and exercise the right to suppress in a summary manner journals deemed obnoxious to the public peace and security. In time of war this right is carried to such an extreme that scarcely any liberty remains to the press of publishing matter either of fact or of opinion. The constitution of France contains no guarantee in behalf of freedom of the press. That of Switzerland does, but authorizes the cantonal governments to enact laws to prevent the abuse of the same, and empowers the Federal government to punish similar abuses when directed against its authority or that of its officers. The constitution of Prussia secures to every person the right to express his opinion freely by word, writing, print, or pictorial representation, and prohibits the establishment of a censorship, but in the same article empowers the Legislature to place restrictions upon the press and to enact laws for the punishment of abuses of the liberty of printing. The laws enacted in pursuance of this provision are very severe and place substantial limitations upon the freedom of the press. In Russia the censorship in an arbitrary form still exists. There newspaper publishers are required to obtain permission to print and then lodge with the government a considerable sum as caution money. Those who are unable to comply with the latter requirement are required to send their articles to a censor three days previous to publication.

In England, after a long struggle, almost complete liberty of press now prevails in time of peace. In war time a rigid and thorough censorship is imposed. From the time of the Reformation until the Commonwealth the English press was subject to a censorship under the direction of the crown. During the period of the Civil War and the Commonwealth it was practically free from molestation, but upon the restoration of the Stuarts the old restrictions were revived. In 1694 the censorship of the press was discontinued. During the reign of Anne severe acts were passed against printers, and some of the most distinguished men of letters of England, including Steele and Defoe, were punished for violating these laws. At the same time numerous tracts, books, and newspapers were burned by the common hangman. The censorship, however, was not revived. With a view to the repression of the obnoxious Whig press, the Tory government imposed on printers a stamp duty, which in the reign of George III was increased to fourpence on every paper. Likewise taxes on advertisements were imposed. But these measures proved ineffective, and were finally repealed towards the middle of the nineteenth century. One of the most prolonged struggles in behalf of the freedom of the press in England was in relation to the publication of parliamentary debates. Until 1729 newspaper reports of parliamentary proceedings were unknown. About that time fragmentary reports began to appear in the newspapers, whereupon the Commons resolved that it was a breach of privilege, as it tended to make members answerable to their constituencies, and this is the theory to-day. For breach of this privilege many printers were prosecuted and fined, in the year 1764 no less than 200 informations being filed in behalf of the crown. (See WILKES, JOHN.) The real liberty of the English press dates from the passage of the Fox Libel Act of 1792, which enacted that the decision in libel suits belonged to the jury and not to the judge. This reversed the view which the courts had acted on for many years. It is the general rule, disregarded naturally in time of war, that the press is unrestricted except in case of libelous matter. But the common-law rule that it is an indictable offense to publish anything against the constitution or the established form of government is still formally in force, though scarcely ever applied.

In the American Colonies the attempt was made to introduce the British system of a rigid censorship, and among the instructions to the Colonial governors was that they were to provide by all necessary orders that no person keep any press for printing and that no book, pamphlet, or other matter be printed without their special leave and license first obtained. There were numerous instances of the public burning of books and the punishment of printers. (See BRADFORD, WILLIAM; ZENGER, PETER.) After the overthrow of British authority in the Colonies the principle of the freedom of the press was incorporated in the first State constitutions, and has been continued in all succeeding ones and without exception. It is usually provided that in prosecutions for libel the truth may be given in evidence, that the motive shall be taken into consideration, and that the jury shall determine both the law and the facts. The great freedom with which the newspapers criticize and often ridicule public officials, especially by means of cartoons and pictures, has sometimes led to something of a reaction in favor of more stringent libel laws. As an example of this may be mentioned the stringent law passed in Pennsylvania in 1903. The Constitution of the United States prohibits Congress from passing any law abridging the freedom of the press. Notwithstanding this provision Congress in 1798 passed an Act for the punishment of persons convicted of printing matter calculated to bring the government into disrepute. It was in force two years, and there were a number of notable prosecutions under the law. In recent years there has been much agitation in favor of restraining the press from the publication of evidence and opinion in the course of criminal trials, on the ground that such publication tends to defeat the ends of justice. The inherent difficulties in the way of discriminating between legitimate views and matter prejudicial to the administration of justice have deterred the Legislatures from adopting a policy of restriction. See ALIEN AND SEDITION ACTS; NEWSPAPER.

PRESS ASSOCIATIONS AND AGENCIES. Associations and agencies for the collection, transmission, and distribution of news began with the telegraph. In continental Europe agencies gather news, pay tolls on its transmission, and sell it to any paper which subscribes for the service. Such agencies are believed, with good reason, to be under government control. A press association, on the other hand, is a coöperative organization of which the members are newspapers, and only those papers which are members can secure the service maintained by the association. In the British Isles agencies and associations exist side by side. Where, as in the United States, there are associations and no agencies, the associated papers possess exclusive rights, and papers outside the pale are at a great disadvantage; but under this system the public receives the greatest benefit.

Baron Paul Julius von Reuter (q.v.) established the pioneer agency service. Eventually he extended his service over the world, and passed the business on to his sons. In Europe are also numerous agencies covering countries (Havas, France; Wolff, Germany, etc.); these follow the lines of Reuter's. In England the Central News Agency, organized in connection with Eastern Telegraph lines, has been conspicuous in its special field. Reuter's and the Central News, together with other agencies—Dalziell's, organized at London and having affiliations with a leading London paper; the National Press Agency; the Exchange Company—supply foreign and London local and provincial news at tariff rates. The Press Association, organized when the English telegraphs were taken over by the government in 1868, is a coöperative organization of newspaper proprietors. The association takes Reuter's foreign service, and furnishes London and provincial news to its subscribers.

The history of American newspaper associations may be divided into three periods. From 1849 to 1882 the Associated Press comprised associations in the larger cities, led by New York, plus State associations serving the dailies in the smaller cities. These associations, through the exchange of news and the exclusion of new papers except by unanimous consent, constituted a virtual monopoly. The central control rested with the New York Associated Press, which, besides possessing a monopoly of New York news, gained substantial control of foreign and Washington news. This news was distributed to city and state associations throughout the country, the service paying most of its own expenses by the rates charged. The ruthless vigor with which the New York association enforced its rules and maintained its monopoly aroused hostility to all press associations, an attitude which has not yet disappeared. The New York Associated Press, whose wide ramifications led the entire organization to be termed the Associated Press, in 1882 found itself confronted with a powerful rival, the Chicago

Associated Press, first organized in 1865. These two associations thereupon made a 10-year agreement to coöperate in an expanded service. When this contract expired in 1892 the old New York Associated Press ceased to exist. Of its seven members the *World* went over to the Chicago, or Western, association, while the other six papers joined (1893) the United Press (not the same United Press that was organized in 1907). Originating in 1867 among a few Eastern papers, by 1871 the United Press had become an evening-paper association and by 1883 had drawn to itself a number of papers, like the Boston *Globe*, which had won success without an Associated Press franchise. In 1894 they were joined by the Southern association. The Western Associated Press and the United Press divided the field until 1900, when a decision of the Illinois Supreme Court held the Chicago association illegal. In October, 1900, while the United Press continued to hold a group of papers led by the New York *Sun*, the leading papers of the United States organized at Chicago a new Associated Press, which was incorporated under a New York statute regulating voluntary organizations not for profit. Within 15 years more than 900 dailies were receiving Associated Press service. In membership, total circulation, and expenditure, this association is without a rival anywhere. In 1915, as the result of an attack made on it under the Sherman Anti-Trust Act (q.v.), after a complaint by the New York *Sun*, admission to its membership was made more liberal and its members were allowed to take any other news service. It is still subject to criticism, but represents an advance on previous associations. The president in 1915 was Melville E. Stone. The original United Press Association became the Laffan News Syndicate after 1889. In 1907 the Publishers' Press (Atlantic coast), the Scripps-McRea League Newspapers (Pittsburgh to Denver), and the Scripps News (Pacific coast) organized the United Press Associations, whose service was thereafter taken by many evening papers and by some morning papers. The president in 1915 was Roy W. Howard. In addition the Hearst News Service and the International News Service are to be mentioned. The newspaper publishers of the United States are organized in the American Newspaper Publishers' Association, which meets annually to legislate on business issues at the same time that the Associated Press meets. For friendly intercourse and discussion there are State press associations and a national association. Canadian papers have been organized since 1859 in the Canadian Press Association, which distributes news and holds a meeting each year; and there is a similar Australian association.

PRESSBURG, prĕs′bụrk (Hung. *Pozsony*). A royal free city geographically in, and capital of, the County of Pressburg, Hungary, situated in a beautiful region on the north bank of the Danube, 35 miles east of Vienna (Map: Hungary, E 2). It is one of the finest cities of Hungary. The fortifications of the old town have given place to spacious boulevards. The Danube is here spanned by the new King Francis Joseph iron bridge. The most attractive of the churches is the eleventh-century Gothic cathedral, restored in 1861–80, in which many of the kings of Hungary were crowned. On the tower is a pyramid surmounted by a gilded royal crown. The old castle, burned in 1811 and existing now only as a ruin, was once the residence of the kings of Hungary. The beautiful thirteenth-century town hall contains a museum of Roman antiquities. The city has several handsome palaces, including the winter palace of the Primate of Hungary. Other features are the Landhaus, the seat of the Hungarian Diet till 1848; the new theatre; the park, with an open-air theatre; and the race course. The equestrian statue of Maria Theresa, erected in 1897, is also noteworthy. Among the educational institutions are a royal law school, a Roman Catholic Gymnasium, a Protestant lyceum, a priests' seminary, several industrial schools, and a rich library. The philanthropic institutions are among the best in Hungary. Pressburg has a large dynamite factory, a famous brush factory, and a petroleum refinery. It also manufactures pastry, turnery, cabinetwork, tobacco, ribbons, cloth, machinery, leather, chemicals, etc. There is a lively trade, chiefly in grain, cattle, and wine. Pop., 1890, 56,048; 1900, 65,867; 1910, 78,223. In 1910 persons to whom Hungarian was the mother tongue numbered 31,705; German, 32,790; Slovak, 11,673. Roman Catholics numbered 59,198; Evangelicals, 10,509; Jews, 8207. The area of the city is 29 square miles.

Pressburg is first mentioned in the ninth century. In the twelfth century it was strongly fortified, and became a place of great strategic importance. From 1541 to 1784 it was the capital of Hungary. Here in 1687 the Hungarian Diet formally accepted the hereditary succession of the Hapsburgs. After the battle of Austerlitz in 1805 Napoleon and the Emperor Francis concluded the Peace of Pressburg (December 26), by which Austria ceded the former Venetian dominions to the Kingdom of Italy and Tirol to Bavaria. Consult Ortvay, *Geschichte der Stadt Pressburg* (Pressburg, 1892–98), and id., *Pressburgs Strassen und Plätze* (ib., 1905).

PRESSED GLASS. See Glass.

PRESSENSÉ, prȧ-säɴ′sȧ′, Edmond Dehault de (1824–91). A French Protestant clergyman. He was born in Paris, studied theology at Lausanne, Halle, and Berlin, and was pastor of the Free Evangelical Congregation of the Taitbout, Paris (1847–70). He was deputy to the National Assembly (1871–76) and advocated amnesty to the National Guards who had joined the Commune, moderation in legislation concerning the International organization, and free education. From 1883 he was a life Senator. He believed that the Evangelical church should be independent of the state. He died in Paris. He founded the *Revue Chrétienne* and the *Bulletin Théologique*. Among many of his works translated into English are *Early Years of Christianity*, four volumes, and *Jesus Christ: His Life and Work*. Consult the biography by H. Loyson (Paris, 1891).

PRESSENSÉ, Francis Dehault de (1853–1914). A French publicist, born in Paris. He served in the Franco-Prussian War (1870–71), was in the diplomatic service at Constantinople and at Washington, and later became one of the principal contributors to the *Temps* and then to the *Aurore*. He was prominent as a defender of Dreyfus. From 1902 to 1913 he was a Socialist deputy from Lyons. In 1903 he advanced his idea of a United States of Europe. Pressensé voted, in 1905, for the separation of church and state. Among his writings are: the important *L'Irlande et l'Angleterre depuis l'acte d'union jusqu'à nos jours* (1889); *Le cardinal Manning* (1896; Eng. trans.); *Manifestations franco-anglo-italiennes pour l'Arménie et la Macédoine* (1904).

PRESS GANG. See IMPRESSMENT.

PRESS'LER, MAX ROBERT (1815–86). A German forester, born in Dresden. He studied at the School of Technology there and taught in Zittau and in the Academy of Forestry at Tharandt until 1883. Pressler contributed largely to the advance of forestry by his inventions, among which the most important is the *messknecht* for measuring the height of trees, and by his writings, which are full of novel theories for the most part based on exact calculation. *Der rationelle Waldwirt und sein Nachhaltswaldbau höchsten Reinertrags* (1858–85), his chief work, is a protest against the methods of the old school.

PRESSURE, CENTRE OF. See CENTRE OF PRESSURE; HYDROSTATICS.

PRESSURE, CRITICAL. See CRITICAL POINT.

PRESSURE, GRADIENT OF. See ISOBAROMETRIC LINES.

PRESSURE, SENSATIONS OF. See CUTANEOUS SENSATIONS.

PRESSURE GAUGE. See MANOMETER.

PRESTATION. See CORVÉE.

PRES'TER JOHN, i.e., Presbyter, or Priest John. A supposed Christian king and priest, whose territory was believed during the Middle Ages to lie either in Asia or in Africa. The first record of this personage appears in the chronicle of Otho of Freisingen, who lived in the twelfth century. From that time the legend grew and developed. It was believed, and various travelers so reported, that the Nestorian Christians had built up a large monarchy ruled over by a priest king named John. Letters from this mysterious personage addressed to the Byzantine Emperor or the Pope were circulated, giving marvelous accounts of the inhabitants and the wealth of the territory. In the fourteenth and fifteenth centuries the home of Prester John was generally believed to be in Africa, where it was identified with the Christian Kingdom of Abyssinia. Consult: Sir Henry Yule, *Cathay and the Way Thither*, published for the Hakluyt Society (2 vols., London, 1866); id., *Book of Sir Marco Polo* (2 vols., ib., 1874); Oppert, *Der Presbyter Johannes im Sage und Geschichte* (2d ed., Berlin, 1870); G. Brunet, *La légende du Prêtre-Jean* (Bordeaux, 1877); S. Baring-Gould, *Curious Myths of the Middle Ages* (London, 1884); J. Buchan, *Prester John* (London, 1910).

PRESTO (It., quick). In music, a direction that a piece should be performed in a very rapid manner. In this tempo conductors mark only the first beat. The term *prestissimo* is also sometimes used to denote the utmost possible rapidity of execution.

PRES'TON. A manufacturing and market town in Lancashire, England, on the Ribble, at the head of its estuary, 21 miles north-northeast of Liverpool (Map: England, D 3). The chief public buildings are the town hall (which contains the guild hall and exchange), the Preston and County of Lancashire royal infirmary, the corn exchange and market house, the house of correction and courthouse, the Harris Institute, the public library, and the institute and school for the blind. St. Walburge's Roman Catholic church is noted for its lofty spire, 306 feet high. Preston's great municipal enterprise was the acquisition of the dock and harbor rights of the Ribble in 1883 for $364,000 and an outlay on improvements of over $6,000,000. The channel was deepened to admit vessels of 17-foot draft, and a dock of 40 acres with warehouses and 8500 feet of quayage was built. Its principal export is coal; its imports are grain, iron, and timber. Besides the Ribble harbor rights the town owns its water supply, tramways, markets, refuse destructor, sewage farm, and maintains baths, free libraries, and three large public parks. Cotton and linen are extensively manufactured. There are iron and brass foundries, iron shipbuilding yards, carriage works, machine shops, and malting, brewing, and ropemaking establishments. Several great fairs are held here during the year, besides the usual weekly markets.

Originally called Priest's Town, from its ecclesiastical institutions, it received its first charter from Henry II. The celebrated Preston guild of merchants has held bidecennial festivals since 1329, the earliest on record. During the Civil War the town declared for the King, but was taken by the Parliamentary forces, and near the town Oliver Cromwell overwhelmed the Scots in 1648. It figured in the Jacobite rebellions of 1715 and 1745. In 1832 Joseph Livesey here originated the total-abstinence movement. Pop., 1901, 112,982; 1911, 117,113. Consult: Hewitson, *History of Preston* (Preston, 1883); Fishwick, *History of the Parish of Preston* (Rochdale, 1900); *Victoria History of the County of Lancaster* (8 vols., London, 1906–14).

PRESTON. A town in Waterloo County, Ontario, Canada, on the Grand Trunk and Canadian Pacific railways, about 55 miles by rail southwest of Toronto (Map: Ontario, E 7). The town has a public library and three parks. Its industrial establishments include planing, rolling, and woolen mills and manufactories of woodworking machinery, furniture, cigars, stoves and furnaces, electric and steam cars, hay machinery, metal shingles, beer, brushes, farm implements, wagons, sleighs, shoes, and piano players. Pop., 1901, 2308; 1911, 3882; 1915 (local est.), 5200.

PRESTON, ANN (1813–72). An American physician and educator, born in West Grove, Chester Co., Tenn., the daughter of Amos Preston, a Quaker. She entered the Woman's Medical College of Philadelphia in 1850, when the institution was opened, graduating in 1852. Here she was professor of physiology and hygiene from 1854 and dean from 1866. Her address to the Philadelphia County Medical Society, which had decided to ignore women physicians, finally gained a victory for her sex. In the field of juvenile literature she wrote *Cousin Ann's Stories for Children* (1848).

PRESTON, HARRIET WATERS (1836–1911). An American novelist and translator, born in Danvers, Mass. Her chief original works are: *Aspendale* (1871); *Love in the Nineteenth Century* (1874); *Is That All?* (1876); *A Year in Eden* (1887); *Private Life of the Romans* (1893), with Miss L. Dodge. Noteworthy among her translations are: *The Life of Madame Swetchine; The Writings of Madame Swetchine* (1869); *Celebrated Women* (selected from Sainte-Beuve's *Portraits de femmes*); Sainte-Beuve's *Madame Desbordes-Valmore* (1872); Paul de Musset's *Alfred de Musset* (1877); Mistral's *Mirèio* (1873); the *Georgics* of Vergil (1881).

PRESTON, JOHN SMITH (1809–81). An

American political leader and Confederate soldier, born at Abingdon, Va. He graduated at Hampden Sidney College in 1824, studied at the University of Virginia and at Harvard, and traveled in Europe. He settled at Columbia, S. C., but had large agricultural interests in Louisiana. For several terms he was a member of the South Carolina State Senate. Preston became an ardent Secessionist and led his State's delegation at the Charleston Convention of 1860. The next year, as one of the commissioners to Virginia, he made a notable speech at Richmond urging the Virginians to leave the Union. He participated in the first battle of Bull Run, but soon afterward was appointed chief of the conscription bureau, with the rank of brigadier general. After the war he lived in Europe for several years. Until his death he remained bitterly hostile to the Federal government.

PRESTON, Margaret (Junkin) (c.1825–97). An American author, born in Philadelphia, Pa. She married T. L. Preston of the Virginia Military Institute and lived afterward in Virginia and Maryland. Her first writing appeared in 1849 in *Sartain's Magazine.* Her first book, *Silverwood* (1856), was a novel. Her later writings are almost entirely poetical and express deep religious feeling and ardent sympathy with the cause of the South in the Civil War, especially in *Beechenbrook* (1866), in which are some widely known lines on Stonewall Jackson's grave and a lyric "Slain in Battle." Other books of hers are: *Old Songs and New* (1870); *Cartoons* (1875); *Colonial Ballads* (1887); *For Love's Sake* (1887); *Aunt Dorothy* (1890). Consult E. P. Allan, *Life and Letters of Margaret J. Preston* (Boston, 1903).

PRESTON, Richard Graham, Viscount (1648–95). An English Jacobite politician and conspirator. He was born at Netherby, Cumberland, was educated at Christ Church, Oxford, and became a member of Parliament at 27. For his support of the Stuarts he was rewarded with a Scottish peerage (1681) and in 1682 was sent on a diplomatic errand to France. He returned (1685) to enter the Parliament of James II, and became a member of the Privy Council. After the downfall of the Stuarts Preston continued to be their agent in France. Upon one of his visits to London he was imprisoned in the Tower for six months but was still regarded by the Jacobites as the true Secretary of State. In 1691 he was condemned to death, but saved himself by betraying his fellow plotters. He translated *Boëthius' De Consolatione Philosophiæ.*

PRESTON, Thomas Scott (1824–91). An American Roman Catholic clergyman. He was born at New Hartford, Conn., of Protestant parents. When he graduated from Trinity College, Hartford, in 1843, he took the vow of celibacy. After completing his course at the General Theological Seminary in New York, he was identified with several Episcopal churches. Coming under the influences of the Tractarian (q.v.) movement, he studied at St. John's College, Fordham, and was ordained a Roman Catholic priest in 1850. He became secretary to Archbishop Hughes and from 1855 till his death administered the chancery. In 1861 he was appointed rector of St. Ann's to succeed Dr. John M. Forbes (q.v.). In 1874 he became vicar-general of the archdiocese; two years later the Pope conferred the title of Monsignor, and in 1888 he was named a Prothonotary Apostolic. He was a strict disciplinarian and warm supporter of parochial schools. He published a number of books on devotional and controversial subjects, among them *Protestantism and the Bible* (1880) and *Protestantism and the Church* (1882).

PRESTON, William Campbell (1794–1860). An American lawyer, orator, and educator, born in Philadelphia, and educated at Washington College (Va.) and South Carolina College. About 1817 he went abroad, met Washington Irving and his brother, and with them made walking trips through Wales and Scotland. He returned to the United States in 1819, was admitted to the bar in 1820, and removed to Columbia, S. C., in 1822. He soon won a great reputation, particularly as a jury lawyer. From 1828 to 1832 he was a member of the Legislature and was a prominent advocate of Nullification (q.v.), of which John C. Calhoun was the leading defender. In 1833 Preston was elected to the United States Senate as a Calhoun Democrat. In 1842, on account of differences of opinion with his constituents, he resigned and resumed the practice of law. From 1845 to 1851 he was president of South Carolina College and lectured on belles-lettres.

PRESTONPANS, prĕs'ton-pănz'. A village in Haddingtonshire, Scotland, on the Firth of Forth, 8 miles east of Edinburgh (Map: Scotland, F 4). It gives its name to the battle fought in the vicinity in which the Jacobites under Prince Charles Edward routed the royal army under Sir John Cope, capturing their cannon, baggage, and military chest, Sept. 21, 1745. Pop., 1901, 3382; 1911, 4722.

PRESTRE DE VAUBAN, Sébastien Le. See Vauban, S. Le Prestre de.

PRESTWICH, prĕst'wĭch. A cotton-manufacturing town in Lancashire, England, 4½ miles north-northwest of Manchester, of which it is a residential suburb. It is a favorite place of residence for Manchester merchants. Pop., 1901, 12,766; 1911, 17,195.

PRESTWICH, Sir Joseph (1812–96). An English geologist. He was born at Clapham, London, and was educated at University College, London. Though engaged as a wine merchant until his sixtieth year, he frequently contributed to the *Transactions of the Geological Society* and in 1874 was appointed professor of geology at Oxford (1874–88). His reputation rests chiefly on his classification of the Tertiary deposits of England, which he was the first to correlate with the strata of the Paris basin, and on his promulgation of the theory of man's contemporaneity with other Pleistocene mammals. Of his publications, the most important is his treatise on *Geology* (2 vols., 1886–88), which is considered one of the best existing presentments of the principles of the science from the point of view of the antiuniformitarian. Professor Prestwich was president of the Geological Society of London (1870–72), vice president of the Royal Society (1870–71), and president of the International Geological Congress (1888). He was knighted in 1896. Consult the *Life and Letters of Sir Joseph Prestwich,* by his widow (London, 1899); also H. B. Woodward, *Joseph Prestwich* (Washington, 1898).

PRESTWICHIA, prĕst-wĭch'ĭ-ȧ (Neo-Lat., named in honor of Sir Joseph Prestwich, the geologist). A fossil merostome found in the Carboniferous coal measures of North America and Europe. The chief interest of this fossil lies in its close resemblance to one of the larval stages of *Limulus,* in which respect it forms a link in the history or phylogeny of the latter peculiar organism. See MEROSTOMATA.

PRESUMP'TION (Lat. *præsumptio*, anticipation, from *præsumere*, to presume, anticipate, take for granted, from *præ*, before + *sumere*, to take). In law, in its broadest sense, an inference as to the existence of a fact not known or proved to exist, which inference arises from its logical connection or association with certain other facts which are known or proved. As thus defined, a presumption may be nothing more than a mere inference of fact such as a jury is required to make in rendering a verdict. Thus, proof of the loss of a vessel in a storm with the other attendant circumstances may create a presumption or inference of the fact of death of a passenger sufficient to justify a jury in finding the death of the passenger as a matter of fact, unless the "presumptive" proof of the fact of death is rebutted or explained away by proof of other circumstances.

In a narrower and more important sense the term signifies an inference of fact which is required by some positive rule of law to be made from the proof or known existence of certain other facts. Thus, the proof that one has not been seen or heard from by his friends or acquaintances for a considerable period, together with other circumstances, may or may not give rise to the presumption of his death; but if the absence is prolonged for a period of seven years, it is a positive rule of the common law that such absence, when unexplained, shall be deemed presumptive evidence of death.

It is evident that the effect of a presumption of this class is to give a weight or significance to facts actually proved in a given case not warranted by logic and not justifying in the absence of an express rule of law a finding by the court or jury of the existence of the fact presumed. Such presumptions are based upon considerations of convenience and serve a useful purpose in aiding in the proof of facts which it might be impossible to establish by any inference logically flowing from facts actually proved. It is for this reason that presumptions of this class are called "presumptions of law," i.e., presumptions required by the law, as distinguished from mere logical inferences of fact. The effect of the presumption is prima facie to establish a fact, which, however, may be rebutted by the proof of other facts inconsistent with the fact presumed.

There is still a third class of presumptions so called, which are not true presumptions at all, but legal fictions. They are in reality rules of substantive law, although stated as presumptions of fact, and consequently they cannot be explained or rebutted. Thus, the conclusive "presumption" that a child under the age of seven has not capacity to commit a crime, or that one is presumed to know the law or the contents of certain public records, is not a presumption, but a positive rule of law which cannot be controverted. Oftentimes such rules of law originated as presumptions of fact, as, e.g., the rule that 20 years' use of a right or interest in real estate gives rise to the conclusive presumption that such use is by virtue of a lost grant and is therefore lawful. Originally the presumption was a presumption of fact, which might be rebutted like any other true presumption, but with the sanction of a long line of judicial decisions the presumption became adopted as a rule of substantive law, if there had been 20 years' user of the property which established the lawfulness of the use as a matter of law, and the question as to whether the use of property was by virtue of a lost grant ceased to be a jury question.

The function of the true presumption of law is primarily to aid a litigant in sustaining the burden of proof cast upon him by the pleadings in a case or by the rules of procedure. Consult J. D. Lawson, *The Law of Presumptive Evidence* (2d ed., St. Louis, 1899). See *Burden of Proof*, under EVIDENCE.

PRETENDER (from *pretend*, OF. *pretender*, Fr. *prétender*, from Lat. *prætendere*, to pretend, allege, hold out, from *præ*, before + *tendere*, to stretch). The name borne in English history by the son and the grandson of the dethroned James II, the two being specifically known as the Old Pretender and the Young Pretender respectively. See STUART, JAMES FRANCIS EDWARD; STUART, CHARLES EDWARD LOUIS PHILIP CASIMIR.

PRETENSE, ESCUTCHEON OF. See ESCUTCHEON.

PRETO'RIA. The capital of the Transvaal Province, formerly the South African Republic, British South Africa, and the administrative capital of the Union of South Africa. It is situated 4500 feet above sea level on the south slope of a spur of the Magalies Berge, in the south-central part of the province, 46 miles by rail, north-northeast of Johannesburg (Map: Cape of Good Hope, J 5). It was regularly laid out on an extensive scale, with wide and straight streets crossing at right angles, but it never acquired much economic importance, owing to the competition of Johannesburg. The Raadzaal, or former Parliament House, 126 feet high, surmounted by a statue of liberty, and the large government offices are the most important buildings. Pop., 1911, 49,743, of whom 29,618 were whites. Pretoria, named after the Boer General Pretorius, was founded in 1855 to succeed Potchefstroom as capital of the Transvaal Republic. In May, 1900, it surrendered to the British, after which its four imposing fortresses were dismantled. Consult Boyd, "Pretoria," in *Anglo-Saxon Review*, vol. iv (London, 1900).

PRETO'RIUS, *Dutch pron.* prā-tō'rī-ụs, MARTHINAS WESSELS (1827–1901). A South African soldier and statesman, the first president of the South African Republic. He was born in Natal, the son of Andries Pretorius, one of the leaders of the "Great Trek" and subsequently commandant general of the Boer forces. He succeeded to his father's rank and position upon his death, in 1852, and strove to carry out his policy, which had for its object the consolidation of the various independent Boer states. He won distinction as a military commander in the wars with the Kafirs and in 1860 was chosen president of the Orange Free State. When, in 1864, the small Boer states north of the Vaal River combined to form the South African Republic, Pretorius left the Free State and threw in his fortunes with the new republic, of which he was at once elected president. He was reelected in 1869, but in the following year, because of dissatisfaction over the arbitration agreement to which he had assented, in reference to territory claimed by the Baralong tribe, he resigned office. The acts of his successor, President Burgers, led in 1877 to friction with the British authorities, and to a proclamation annexing the Transvaal to the British Empire.

Pretorius took a prominent part in the revolt which followed, and after the independence of the republic was recognized in 1880 he, with Kruger and Joubert, organized a provisional government. Pretorius expected to be chosen president, but the commanding position won by Paul Kruger in the struggle led to his election in 1883 and the final retirement of Pretorius to private life. One of the most conservative of Boer leaders, during his last years he bitterly opposed the war policy of Kruger, declaring prophetically that it meant the final extinction of both the Boer republics. He died at Potchefstroom, May 19, 1901. Pretoria, the administrative capital of the Union of South Africa and of the Province of the Transvaal, was named for him.

PREUSSISCH-EYLAU. See EYLAU.

PREVENTION OF CRUELTY TO ANIMALS. See CRUELTY TO ANIMALS, PREVENTION OF.

PREVENTION OF CRUELTY TO CHILDREN. See CRUELTY TO CHILDREN, PREVENTION OF.

PREVENTIVE MEDICINE. See HYGIENE, *Military Hygiene.*

PREVESA, prĕ′vȧ-zȧ *or* prȧ-vā′zȧ. A fortified seaport of Greece, in the Department of Janina, situated at the entrance to the Gulf of Arta (Map: Balkan Peninsula, C 5). Formerly a town of the Ottoman Empire, it was annexed to Greece as a result of the Balkan War (q.v.) of 1912–13. It has considerable trade. Pop., about 7000.

PREVIOUS QUESTION. A question put to a parliamentary assembly upon motion of a member to ascertain whether it is the will of the assembly to vote at once and thus put a stop to further debate on the subject under consideration. The form of the previous question is: "Shall the main question now be put?" If the vote is in the affirmative, the subject under discussion must then be voted on without further debate on the main question or amendment. This puts it in the power of a bare majority to shut off debate at any time. Under the name of closure this method of parliamentary tactics was first extensively resorted to by Mr. Gladstone in the House of Commons in 1882 in order to prevent dilatory or obstructive motions of the minority. It has been frequently resorted to in the United States House of Representatives from the earliest time, but up to the present time has not been tried in the Senate, where the practice of unlimited debate is allowed. In the House of Representatives the defeat of the previous question operates to keep the business before the House as though no motion had been made, but in the English Parliament it has the effect of postponing consideration for the day. The object of the practice in the United States is to hasten action, and a motion is made by a friend of the measure; in the English Parliament the purpose is to get rid of the subject for the time, and the motion is made with the purpose of voting against the measure.

PREVORST, prȧ′fȯrst, SEERESS OF (1801–29). A German clairvoyante, whose real name was Friederike Hauffe. She was the daughter of a forester of Prevorst. In 1826 she met the German poet Justinus Kerner (q.v.), whose book on her was translated into English by Mrs. Catherine Crowe as *The Seeress of Prevorst* (1845).

PREVOST, prĕ-vō′ *or* prĕv′ȯ, AUGUSTINE (1725–86). A British soldier. He was born in Geneva, Switzerland, entered the British army, and in the French and Indian War distinguished himself in Wolfe's attack on Quebec. He became lieutenant colonel in command of the Sixtieth Regiment in 1761, and after the death of Gen. Henry Bouquet in 1765 commanded the British troops in the Southern Department, with headquarters at Pensacola. In 1778 he subdued temporarily an uprising in Georgia. In 1779 he abandoned Augusta on the approach of General Ashe, but later, at Brier Creek, turned and administered a severe defeat to his pursuers. He then drove Moultrie back on Charleston, laying waste the country and encouraging his Cherokee allies to acts of the greatest barbarity. Before he could take Charleston, however, Moultrie, its commander, was joined by Pulaski and Prevost withdrew into Georgia. Later in 1779 he repulsed an attack on Savannah by the combined French and American forces under D'Estaing and Lincoln. For this success he was promoted major general. He was the father of Sir George Prevost.

PREVOST, SIR GEORGE (1767–1816). A British soldier and administrator, son of Augustine Prevost. He was born in New York City, entered the British army in 1783, when he became captain, and between 1790 and 1801 saw service in the West Indies, commanding the British troops in St. Vincent in 1794–95 and acting as Military Governor of St. Lucia from 1798 to 1801, after which for a year he was Civil Governor. In 1802 he was appointed Captain General and Governor in Chief in Dominica. Created Baronet in 1805, he was the same year made major general and three years later lieutenant general. In 1808 he was appointed Lieutenant Governor and commander in chief of Nova Scotia, in 1809 was second in command at the capture of Martinique, and in September, 1811, succeeded Sir James Craig as Governor of Lower Canada and Governor-General of British North America, which position he retained throughout the War of 1812, nominally, but not always actually, directing, as commander in chief, the British operations in Canada. On May 29, 1813, in concert with Sir James Yeo, he made an unsuccessful attack upon Sacketts Harbor, N. Y., and on Sept. 11, 1814, in conjunction with Downie, who commanded the naval forces, was again unsuccessful in an attack upon Plattsburg, N. Y., where he was repulsed by the Americans under Macomb. For his faintheartedness or lack of enterprise on the latter occasion he was called before a court-martial, but died before a verdict could be rendered.

PRÉVOST, prȧ′vȯ′, (EUGÈNE) MARCEL (1862–). A French novelist, born in Paris, May 1, 1862. He was educated by the Jesuits and at the Polytechnic School, engaged in tobacco manufacturing, and entered the literary field in 1891. In 1887, however, he published *Le scorpion*, an attack on Jesuit education; and this story was followed by *Chonchette* (1888) and *Mademoiselle Jaufre* (1889), both of which were less crude and more sentimental and idyllic, though with some affectation of moralizing. *Cousine Laura* satirized the distortions of love, and the author pursued the theme in *La confession d'un amant* (1891). His next work, *Lettres de femmes* (1892), was the first to win distinct notice. It was succeeded by *Nouvelles lettres de femmes* (1894) and *Dernières lettres de femmes* (1897). The series are gracefully written, witty, ironical, ingenious, and thoroughly seasoned to the moral taste of the French. The dominant note is sensual perversity. *L'Automne d'une femme* (1893) is nobler, but *Les demi-vierges* is distasteful and *Le moulin de Nazareth* (1894) may be classed as revolting. *Notre compagne* (1895), a collection of stories, is, on the other hand, never vulgar, always clever, and often pure; and *Le jardin secret* (1897) is a strong and worthy narrative of conventional marriage, with the moral of Goethe's *Die Mitschuldigen*. In 1900 appeared *Les vierges fortes*, which was composed of two volumes, *Frédérique* and *Léa*. In 1901 *L'Heureux ménage* was published. These last volumes deal with the woman question, both as concerns the education and the free life of young girls and the marriage relation. M. Prévost does not appear to find that the new or higher education for young women, as he understands its development in England and America, points to anything very satisfactory for the French. Later works are the novels *Le pas relevé* (1902); *Lettres à Françoise* (1902); *La princesse d'Erminge* (1904); *L'Accordeur aveugle* (1905); *Monsieur et Madame Moloch* (1906); *Femmes* (1907); *Lettres à Françoise mariée* (1908); *Pierre et Thérèse* (1909); *Missette* (1911); *Lettres à Françoise maman* (1912), and the drama *La plus faible* (1904). As a whole his stories suggest Bourget and Maupassant. At his best he is less powerful, less searching, but in narration he is admirably deft, lucid, compact, swift, and unerring. His feminine psychology is masterly. Prévost was elected to the French Academy in 1909. Consult Winifred Stephens, *French Novelists of To-day* (New York, 1914).

PRÉVOST, Pierre (1751–1839). A Swiss physicist and philosopher, born at Geneva. He studied theology and law, became professor of philosophy in 1780 at the Akademie der Wissenschaften in Berlin, and after 1784 held a similar chair at Geneva until 1810, when he was made professor of physics. He formulated the law of exchange in radiation. Prévost revised G. L. Le Sage's *Traité de physique* and published various works on physics and philosophy.

PRÉVOST D'EXILES, prȧ′vō′ dȧg′zēl′, Antoine François (1697–1763). A French novelist, best known as the author of *Manon Lescaut* (q.v.). Prévost was born at Hesdin, April 1, 1697. His father was a petty official. Antoine had been by turns a student of the Jesuits, a novice among them, a soldier (1713–14), a Jesuit, a soldier again, and, as "the unhappy end of a too tender attachment," a Benedictine (1721–28). Then we hear of him as wanted by the police for a libel on the Duke of Tuscany and for alleged breaches of conventual discipline. It was a fateful period in the history of the French novel when Prévost sought refuge in England (1728), where he remained for two or three years and, after a hasty and not wholly voluntary departure, returned thither in 1733 famous as author of the *Mémoires d'un homme de qualité*, the seventh volume of which is his greatest and shortest novel, *Manon Lescaut* (1731). Prévost remained once more two years in England, viewed askance by the Huguenot colony, and so thrown more with the English, the result of which appears in *Cléveland, ou le philosophe anglais* (8 vols., 1731–38); *Les mémoires de M. de Monteal;* and an Irish novel, *Le doyen de Killerine* (6 vols., 1735–40), which he followed after his return with a story based on the life of the fascinating Greek girl, Mademoiselle Aïsse, then a reigning Parisian celebrity. He died at Chantilly, Nov. 23, 1763.

Prévost wrote two other novels besides those already mentioned, *Mémoires pour servir à l'histoire de Malte* and *Mémoires d'un honnête homme;* but the later years of his life were devoted almost wholly to translations of the novels of Richardson, begun in 1742, by which he influenced literature even more than by *Manon Lescaut*, propagating an undiscriminating interest in England and the English, whose democratic spirit inspired him to warm enthusiasm. Thus he helped to shake French confidence and pride of social and intellectual superiority and to pave the way both for a cosmopolitan literary spirit and for Rousseau.

His average work closely resembles the lesser novels of Defoe, but *Manon* affected radically the novels of Rousseau and Diderot, and can be traced through Hugo and Dumas and George Sand to the present day. Prévost himself tells us that the story is "a terrible example of the force of passion." In Richardson Prévost found a fuller expression of himself than he had yet been able to attain. *Pamela* in English began to appear in 1740. Prévost recognized its value instantly, and in 1742 his French version appeared in London. The English *Clarissa* is of 1748–49, the French of 1751. Richardson begins *Grandison* in 1753; Prévost, while awaiting its completion, busies himself in an attempt to spread English and German literature in France through founding with Rousseau a *Journal Etranger*. Prévost's work was that of editor as much as translator, and Richardson greatly profited by the process. Prévost's *Œuvres choisies* appeared in 39 volumes (Amsterdam, 1783–85, 1806). Of *Manon Lescaut* the editions are many. Consult: C. A. Sainte-Beuve, in *Causeries de lundi*, vol. ix (Paris, 1862); id., in *Portraits littéraires* (vols. i–iii, 2d ed., ib., 1864); Henry Harrisse, *L'Abbé Prévost* (ib., 1896); V. Schroeder, *Un romancier français au XVIIIe siècle, l'abbé Prévost: la vie, ses romanes* (ib., 1898); Texte, *Jean Jacques Rousseau and the Cosmopolitan Spirit in Literature*, English translation (New York, 1899).

PRÉVOST-PARADOL, pȧ′rȧ′dōl′, Lucien Anatole (1829–70). A French journalist and author, born in Paris. He studied at the Collège Bourbon and at the Ecole Normale and in 1851 obtained the French Academy's prize for eloquence. After obtaining his degree of doctor of letters in 1855, he was appointed to the chair of French literature at Aix, but in the following year resigned his professorship and became one of the editors of the *Journal des Débats*, writing most of the leading articles. He also wrote for the *Courrier du Dimanche*, and his opposition to the Empire and his advocacy of a responsible ministry brought him into difficulties with the censorship. In 1865 he was elected a member of the Academy, and in 1868 visited England, where he received a warm welcome. Believing that the Empire had at last adopted the principle of parliamentary government, he consented in 1870 to fill the post of Envoy at Washington. The Franco-Prussian War affected him so greatly that he committed suicide in Washington. He died July 20, 1870, nine days after shooting himself. His chief works are: *Revue de l'histoire universelle* (1854); *Essais de politique et de littérature* (1859–63); *Quelques* *pages d'histoire contemporaine* (1862–66); *La France nouvelle* (1868). Consult Gréard, *Prévost-Paradol* (Paris, 1894).

PREWITT, proo͞′ĭt, Theodore F. (1832–1904). An American surgeon. He was born at Fayette, Howard Co., Mo., studied at the St. Louis Medical College (M.D., 1856), and settled in St. Louis, where he practiced until his death. He held several important hospital offices, for 25 years serving as surgeon to St. John's Hospital. In 1875 he became professor of surgery in the Missouri Medical College and later was elected dean. On the consolidation of the Missouri Medical College with the St. Louis Medical College to form the medical department of Washington University, Prewitt was continued in the chair of surgery, which he occupied until his death. He served as president of the Missouri State Medical Society and of the American Surgical Association.

PREYER, prī′ẽr, Wilhelm Thierry (1841–97). A German physiologist and psychologist, born at Moss Side, near Manchester, England. He was educated at the universities of Bonn, Berlin, Heidelberg, Vienna, and Paris, became a lecturer in the philosophical faculty at Bonn in 1865, in 1867 in the faculty of medicine also, and in 1869 was appointed professor of physiology and director of the physiological institute at Jena. He was a lecturer at Berlin from 1888 to 1893, when he returned to Jena. Preyer made laboratory investigations in regard to spectrum analysis, propounded a theory of sleep, investigated the limits of perception of pitch, and applied the principles of H. G. Grassmann's (q.v.) theory of extension to psychology. He also conducted researches in connection with the blood, respiration, the color sense, and other subjects. Among his writings are: *Die Blausäure* (2 parts, 1868–70); *Die Blutkrystalle* (1871); *Das myophysische Gesetz* (1874); *Ueber die Ursache des Schlafes* (1877); *Die Entdeckung des Hypnotismus* (1881); *Der Hypnotismus* (1890); *Darwin: sein Leben und Wirken* (1896).

PRI′AM (Lat. *Priamus*, from Gk. *Πρίαμος*). In Greek legend, a son of Laomedon and Strymo, or Placia (others give his mother other names), and last King of Troy. His name was originally Podarces (swift foot), but was changed to Priam on account of his having been ransomed by his sister Hesione from Heracles, who had made him prisoner when he captured Troy from Laomedon. His first wife was Arisbe, daughter of Merops, whom he gave away to a friend in order to marry Hecuba, by whom, according to Homer, he had 19 sons, though from other wives the number was increased to 50 and as many daughters, whose names, with some variations, may be found in Apollodorus and Hyginus. The best known of the sons are Hector, Paris, Deïphobos, Helenus, Troïlus, and of the daughters, Cassandra and Polyxena. Priam is represented as too old to take any active part in the Trojan War; in Homer (*Iliad*, iii) he appears only once on the field of battle, to ratify the truce before the duel of Paris and Menelaus. He, however, takes part in Trojan councils, and after the death of Hector visits the Grecian camp, guided by Hermes, to ransom the body of his son from Achilles. The later epics recounted his death at the capture of the city in somewhat different ways. The usual account represents him as slain, after a feeble attempt at resistance, by Pyrrhus, son of Achilles, in his own palace court at the altar of Zeus Herkeios, where he had taken refuge. Cf. Vergil, *Æneid*, ii, 486–558. See Troy.

PRIA′PUS (Lat., from Gk. *Πρίαπος*, *Priapos*, *Πρίηπος*, *Priēpos*). One of the lesser figures in the ordinary Greek and Roman mythology, though at Lampsacus, Cyzicus, and other places in the fertile districts on the Hellespont and the Propontis he was held in high honor. The Lampsacene tradition called him son of Dionysus and Aphrodite, but his parentage was variously related. He was a god of fruitfulness and reproduction, particularly of gardens and vineyards, though his protection was extended also to the flocks and herds. In art he was sometimes represented as old and effeminate, clothed in Asiatic garb, a kerchief on his head, and with the folds of his garment held up and filled with fruit. More commonly his image was set up in gardens and vineyards to scare away birds and thieves. The character of these images led to many coarse jests in the poets and elsewhere. (Consult Horace, *Sermones*, i, 8.) The *Priapea* is a collection of 80 short Latin poems, partly collected from the walls of the temple of Priapus, and for the most part apparently not later than the Augustan age. Consult Bücheler, *Petronius, etc.* (5th ed., Berlin, 1912). For Priapus, consult the article "Priapos" in W. H. Roscher, *Lexikon der griechischen und römischen Mythologie*, vol. iii (Leipzig, 1897–1909).

PŘIBRAM, przhē′brȧm, or **PRZIBRAM**. A town of the Crownland of Bohemia, Austria, 33 miles southwest of Prague (Map: Austria, C 2). It derives its importance from extensive lead and silver mines in the neighborhood, the largest in the Empire. They were worked as early as 1330, and since 1819 have been mainly the property of the government. One of the shafts, the Albertschacht, is 3637 feet deep. Close to the town is the Heilige Berg (1903 feet), a shrine visited by more than 100,000 pilgrims yearly. Pop., 1900, 13,576; 1910, 13,330, mostly Bohemians.

PRIBER, prē̇′ḅâr′, Christian. A French Jesuit who went among the Cherokee in 1736 and settled at Great Tellico town, in what is now east Tennessee. He at once set to work studying the Cherokee language, compiling a dictionary and grammar and adapting himself to the native dress and mode of life for the time in order better to accomplish their civilization and conversion. He drew up for their adoption a regular form of government modeled upon the European plan, with a prominent chief as principal ruler and himself as secretary. Fearing that the result would be to win over the Cherokee to the French interest, the English government of South Carolina undertook to arrest him, but the Indians refused to give him up, and the commissioner was obliged to return under safe-conduct of an escort furnished by Priber. In 1741, however, he was seized by some English traders while journeying in Alabama and sent as a prisoner to Frederica in Georgia, where he soon afterward died in prison.

PRIBILOV, prē′bė-lô̇f′, **PRIBILOF** (or Seal) **ISLANDS**. A group of small volcanic islands in Bering Sea, belonging to the United States, named for their discoverer, Pribilov, in 1786. They are 200 miles southwest of the Alaskan mainland (Map: Alaska, D 7). St. Paul, the largest, has an area of 35 square miles and had a population of 201 in 1910, and St. George, the next in size, an area of 27 square miles and a population of 90. They are isolated and surrounded by fog, which probably causes the otary, or fur seal, to select these grounds for the purpose of breeding, so that these islands are the centre of the Bering Sea seal fisheries. The Pribilovs were made a fur-seal reservation in 1868. Churches, schools, and sanitation have materially improved the condition of the natives. Reindeer have lately been introduced with success. On St. Paul the United States navy has a wireless station. Consult: H. W. Elliott, *Our Arctic Province* (New York, 1887); A. W. Greely, *Handbook of Alaska* (ib., 1914); E. L. Jones, *Report of Alaska Investigations in 1914* (Washington, 1915).

PRICE, BARTHOLOMEW (1818–98). An English mathematician, born at Coln St. Denis, Gloucestershire. He graduated B.A. in 1840 and M.A. in 1843 at Pembroke College, Oxford, where he became a fellow in 1844 and tutor and mathematical lecturer in 1845, and was public examiner in 1847–48 and 1853–55 and proctor in 1858. From 1853 until shortly before his death he held the Sedleian chair of natural philosophy at Oxford, and in 1891 was elected master of Pembroke College. Price was author of *A Treatise on the Differential Calculus* (1848) and of an important *Treatise on Infinitesimal Calculus* (4 vols., 1852–60; 2d ed., 1857–89).

PRICE, BONAMY (1807–88). An English economist. He graduated at Worcester College, Oxford, in 1829, taught from 1830 to 1850 at Rugby, and from 1868 until his death held the Drummond professorship of political economy at Oxford. He was an earnest advocate of the principles of free trade and, in a series of lectures delivered in the United States (1874), he gave vigorous expression to his opinion on the subject. His publications include: *The Principles of Currency* (1869); *Currency and Banking* (1876); *Practical Political Economy* (1878).

PRICE, IRA MAURICE (1856–). An American Semitic scholar, born near Newark, Ohio. He graduated at Denison University in 1879 and for a year was professor of Greek and modern languages at the University of Des Moines, Iowa. He was instructor (1886–88) and professor (1888–92) of Hebrew and cognate languages in the Baptist Union Theological Seminary, then, at the University of Chicago, associate professor and after 1900 professor of Semitic languages and literature. Dr. Price became associate editor of the *American Journal of Semitic Languages and Literature* in 1892 and of the *American Journal of Theology* in 1897. His works include: *An Introduction into the Inscriptions Discovered by Mons. E. de Sarzec* (1887); *A Syllabus of Old Testament History* (1890; 8th ed., 1912); *Introduction to Old Testament* (1891); *The Monuments and the Old Testament* (1899; 5th ed., 1907); *The Ancestry of our English Bible* (1907; 5th ed., 1911).

PRICE, LANGFORD LOVELL (1862–). An English economist, born in London. He was educated at Trinity College, Oxford, in 1888 became fellow and treasurer of Oriel, and was Newmarch lecturer in statistics at University College, London, in 1895–96. In 1897 he was governor of Dulwich College and in 1898 was appointed an examiner in the moral sciences tripos at Cambridge. Price's writings include: *Industrial Peace* (1887); *A Short History of Political Economy in England* (1891; 2d ed., 1896); *Money and its Relation to Prices* (1896; 3d ed., 1909); *Economic Science and Practice* (1896); *A Short History of English Commerce and Industry* (1900); *The Position and Prospects of the Study of Economic History* (1908); *Co-operation and Co-partnership* (1914).

PRICE, RICHARD (1723–91). A British nonconformist divine and political and moral philosopher. He was born at Tynton, Wales, the son of a dissenting minister of stern Calvinistic tendencies. For most of his life after 1743 he was at Stoke Newington as private chaplain or preacher. In 1769 he published his *Treatise on Reversionary Payments;* this was followed in 1771 by his *Appeal on the Subject of the National Debt* and by the compilation and publication of the celebrated *Northampton Mortality Tables* and various important works relating to life assurance and other annuities. In 1776 appeared his *Observations on Civil Liberty and the Justice and the Policy of the War with America.* Of this work 60,000 copies are said to have been sold in a few months. So greatly was it admired in the United States that the American Congress in 1778, through Franklin, communicated to him their desire to consider him a fellow citizen and to receive his assistance in regulating their finances, an offer which he declined, principally on the ground of age. The work procured him the freedom of the city of London, and in 1783, at the same time as Washington, he received the honorary degree of LL.D. from Yale University. His importance as a philosopher is measured by his *Review of the Principal Questions in Morals* (1757; 3d ed., rev. 1787). He died April 19, 1791. Consult William Morgan, *Memoirs of the Life of Richard Price, D.D.* (London, 1815).

PRICE, STERLING (1809–67). An American Confederate soldier, born in Prince Edward Co., Va. He was educated at Hampden Sidney College, but removed to Chariton Co., Mo., in 1831. In 1844 he was elected to Congress, but in 1846 he resigned and raised the Second Missouri Cavalry for the Mexican War. Under Gen. Stephen W. Kearny he marched from Fort Leavenworth to Santa Fe, suppressed an insurrection, and completed the conquest of California. He was promoted brigadier general of volunteers in 1847, and the next year defeated a Mexican force at Santa Cruz de Rasales. From 1853 to 1857 he was Governor of Missouri. In the beginning of 1861 he was a Conditional Union man and was president of the convention called to consider the secession of the State. Eventually he joined the Secessionists, was appointed major general of State troops, and began to organize the forces. He participated, under McCulloch, in the battle of Wilson's Creek (1861) and under Van Dorn in the battle of Pea Ridge (1862) and was made a major general of the Confederate army. Price was assigned to command the Army of the West, but operated first in Tennessee. On Sept. 19, 1862, he was defeated by Rosecrans at Iuka, Miss., and on October 3–4 took part in General Van Dorn's unsuccessful attack on Corinth. Until February, 1863, he served in northern Mississippi. The next July he took part in the unsuccessful attack on Helena, Ark. While in command of the district of Arkansas, under Gen. E. Kirby Smith, he opposed Gen. Frederic Steele. In September, 1864, he made a raid into Missouri, fought a number of battles and skirmishes, and gained

5000 recruits, but was forced to retreat into southwest Arkansas. After the close of the war he went to Mexico and became interested in a colonization scheme, but soon returned. Consult T. L. Snead, *The Fight for Missouri* (New York, 1888).

PRICE, Thomas Randolph (1839–1903). An American English scholar, born at Richmond, Va. He studied at the University of Virginia and at Berlin and Kiel until 1861, when he went home and served in the Confederate army during the Civil War. In 1867 he was appointed to the professorship of Latin and Greek at Randolph College, and afterward had the chair of Greek and English there and the chair of Greek in the University of Virginia until 1882, when he was made professor of English language and literature in Columbia University. He edited *Othello* in the Bankside Shakespeare (1890), and previously published *The Teaching of the Mother-Tongue* (1877) and *The Construction and Type of Shakespeare's Verse as Seen in Othello* (1888).

PRICHARD, prĭch′ard, James Cowles (1786–1848). An English physician, ethnologist, and scholar, born at Ross, Herefordshire, and educated in medicine at Bristol, London, and Edinburgh. He upheld the ethnological theory of the primitive unity of the human race. In addition to his classical studies and the mastery of French, Italian, Spanish, and modern Greek, he devoted himself to Celtic, and was the first to show the Indo-Germanic character of the Celtic group of languages. In another field his *Treatise on Insanity and Other Disorders Affecting the Mind* (1835) was long a standard work. In 1845 he was appointed a commissioner in lunacy in London. Prichard was virtually the founder of anthropological science in England. Among his numerous works the most important are: *A Review of the Doctrine of a Vital Principle* (1829); *Eastern Origin of the Celtic Nations* (1831); *Researches into the Physical History of Mankind* (5 vols., 1836–47); *Different Forms of Insanity in Relation to Jurisprudence* (1842); *Natural History of Man* (1843); *On the Relation of Ethnology to Other Branches of Knowledge* (1847).

PRICKLY HEAT. The popular name for *miliaria papulosa*, an eruptive skin disease, caused by obstruction of the sweat ducts and characterized by a large area of small, red, acuminate papules crowded closely together, with excessive sweating, heat, and itching. In tropical countries it is a formidable disease. In temperate climates it is frequently seen in a mild form during hot weather. Cathartics internally and cooling lotions (such as weak carbolic acid, solution of boric acid or of bicarbonate of soda) locally give relief. In babies the disease is a source of acute suffering. Prophylactic measures consist of clothing the child in loose, cool, absorbent materials, bathing it frequently, and keeping it out of the heat. See Miliaria.

PRICKLY PEAR, or Indian Fig (*Opuntia*). A genus of 200 or more species of cacti, fully half of which occur in the southwestern United States. Their fleshy, spiny or hairy stems, generally formed of compressed or cylindrical articulations, are leafless, except upon younger shoots, which produce small, cylindrical, early, deciduous leaves. The flowers, which spring from among the clusters of prickles or from the margin or summit of the articulations, are solitary, or corymbose-paniculate, generally yellow, rarely white or red. The fruit, which resembles a fig or a pear, with clusters of prickles on the skin, is mucilaginous and generally eatable. Some species are used for hedge plants in warm countries. The common prickly pear, or Indian fig (*Opuntia vulgaris*), a low-growing native of the eastern United States from Massachusetts southward, is naturalized in many Mediterranean and other warm countries. It grows well on rocks, and spreads over expanses of volcanic sand and ashes too arid for almost any other plant. Its yellow or purple tinged oval fruit, somewhat larger than a hen's egg, has a pleasant acid flavor, but is inferior to that of *Opuntia ficus indica*, of which there are many distinct varieties. It is extensively used in many countries as an article of food. The dwarf prickly pear, a variety of *Opuntia vulgaris*, very similar, but smaller, and having prostrate stems, is naturalized in Europe as far north as the sunny slopes of the Tirol. The tuna (*Opuntia tuna*), much used in some parts of the West Indies as a hedge plant, and also valuable as a food of the cochineal insect, has red flowers with long irritable stamens and an edible fruit. *Opuntia engelmanni* (see Plate of Cacti) is one of the larger flat-jointed species common from Texas westward. From Texas to California and in Mexico are many species with cylindrical stems and upright habit of growth, some attaining a height of 10 feet or more. Some of the thick, fleshy, flat-jointed species are eaten by stock in spite of their spines. Sometimes the spines are singed off to make the plants less difficult to eat. Spineless varieties are grown for the special use of stock. In the Cape of Good Hope, Australia, and elsewhere the species introduced for stock food have become a serious pest.

PRIDE, Thomas (?–1658). A soldier during the great Civil War in England. He was early a brewer. In 1644 he entered the Parliamentary army as captain, and for a time served under Essex. His promotion was rapid, and he distinguished himself in several of the great battles, notably at Naseby in 1645, where he commanded Harley's regiment. In the quarrel between the army and Parliament he energetically supported the former, and was given command of Harley's regiment. On Dec. 6, 1648, under orders from Fairfax, he prevented about 140 members from sitting in the House of Commons, arresting over 40 of them, in order to prevent an agreement with Charles I. This incident has gone down in history as Pride's Purge. Pride was a commissioner at the trial of the King and was one of those to sign the death warrant. He died Oct. 23, 1658. At the Restoration he was attainted as one of four regicides, but his body does not seem to have been exhumed.

PRIDE AND PREJUDICE. A novel by Jane Austen (1813), written in 1796.

PRIDEAUX, prē′dō, Humphrey (1648–1724). An early English Oriental scholar. He was born at Padstow, Cornwall, and was educated at Westminster and at Christ Church, Oxford (B.A., 1672). In 1676 he published in Oxford an account of the Arundelian marbles, under the title of *Marmora Oxoniensia.* In 1679 the Lord Chancellor Finch appointed him rector of St. Clement's at Oxford and in 1681 a canon at Norwich. In 1688 he became Archdeacon of Suffolk and in 1702 dean of Norwich. His principal works are his *Life of Mahomet* (1697), long popular, but inaccurate and now superseded, and *The Connection of the History of the Old and New Testament* (1715–16), for many years a standard work. His *Life* was published in London in 1748, and his letters to John Ellis were edited for the Camden Society by Thompson (London, 1875).

PRIDEAUX, John (1718–59). An English soldier, born in Devonshire, England. He became ensign in the British army in 1739, took part in the battle of Dettingen, Germany, in 1743, fought in America against the French, became colonel and brigadier general, was intrusted by General Amherst with the command of the expedition to reduce Fort Niagara in 1759, and while preparing for the siege was killed in the trenches by the accidental bursting of a shell. For an account of his expedition, consult Francis Parkman, *Montcalm and Wolfe* (Boston, 1884).

PRIDE OF INDIA. See China Tree.

PRIDE'S PURGE. See Pride, Thomas.

PRIEGO DE CÓRDOBA, prē̇-ā′gō̇ dȧ kôr′-dō̇-bȧ. A town of south Spain in the Province of Córdoba, situated about 50 miles southeast of the city of that name (Map: Spain, C 4). It has a very old church and the ruins of an old castle. The chief manufactures are cotton textiles and olive oil. Pop., 1910, 17,691. Priego was an important fortress under the Moors and was several times captured and recaptured.

PRIENE, pri̇-ē′nē̇ (Lat., from Gk. Πριήνη). A Greek city of Asia Minor, situated on the north shore of the Latmic Gulf on a projecting spur of Mount Mycale. The Acropolis and the earliest settlement were on a plateau inaccessible except by rock-cut steps, while the later city covered a series of lower terraces. Priene was one of the 12 cities of the Ionian League and claimed as its founder Æpytus or Ægyptus, son of Neleus, though tradition told of a second body of settlers from Bœotia, who gave to the place in early times the name Cadme. At that time the city was close to the shore and possessed a small but good harbor, which has now been completely destroyed by the alluvial deposits of the Mæander, which have filled the greater part of the ancient gulf. Even in Strabo's time the city was over 4 miles from the coast, and the distance is now much greater. The city was from an early period involved in a quarrel with Samos about the ownership of lands on Mount Mycale, and inscriptions show that the dispute was not settled until Roman times. It was conquered in the second half of the seventh century B.C. by the Lydian King Ardys, and later, for its support of a Lydian revolt, it was severely treated by the Persians. Its prosperity was renewed by the wise councils of Bias (q.v.), but it again suffered for its participation in the Ionic revolt (500–494 B.C.) from Persia. Later it came under the rule of the Athenians and was about 442 B.C. placed by them under the protection of Miletus. During the fifth and fourth centuries it seems to have been of small importance, and its real development took place after Alexander's conquest of Asia. Under his patronage was erected the beautiful temple of Athena Polias, the work of the architect Pythias, who seems also to have laid out the new city on the lower terraces. This temple was excavated by Pullan and Newton for the Society of Dilettanti in 1868 and found to be a masterpiece of Ionic architecture, rivaling in its proportions and finish the Erechtheum at Athens, though with interesting variations in details. The gradual silting up of the bay must have made the place unhealthy, and under the Byzantine emperors the city was deserted. Fortunately no later settlers were attracted to the site, and thus the ancient houses and buildings fell into ruin or were destroyed by earthquake and buried in débris.

From 1895 to 1898 excavations were undertaken for the Berlin Museum by Th. Wiegand, and as a result the ancient city has been uncovered, and for the Greek town life of the Hellenistic age Priene must take a place similar to that occupied by Pompeii (q.v.) for the life of Italy under the early Empire. The city was planned with great care. East and west, parallel to the mountain side, ran a series of straight streets, connected at regular intervals by narrow lanes, which ascend the hill. The rectangles thus formed were normally 35 × 47 meters and contained four houses, whose entrances were on the side streets, so that on the thoroughfares were only blank walls, unbroken save perhaps by windows in the upper stories. The theatre, council house, market place, temple of Æsculapius, and other public buildings were also laid bare, and a wealth of inscriptions and smaller objects recovered. Preliminary reports of the excavations may be found in the *Archäologischer Anzieger*, published in the *Jahrbuch des archäologischen Instituts* (Berlin, 1900). In 1904 Th. Wiegand and H. Schroder published a work entitled *Priene, Ergebnisse der Ausgrabungen und Untersuchungen in den Jahren 1895–98* (Berlin). A popular account by A. L. Frothingham was published in the *Century Magazine*, vol. lxii (New York, 1901); another, by W. G. Leutner, appeared in the *Classical Weekly*, vol. v (ib., 1911). In 1910 a colored lithograph, giving a bird's-eye view of the excavation, by A. Zippelius, was published (Leipzig, 1910); as explanatory of this Th. Wiegand published "Priene, ein Begleitwort zur Rekonstruktion von A. Zippelius," in *Neue Jahrbücher für das klassische Altertum*, vol. xxv (Leipzig, 1911). Consult also H. von Gärtringen, *Inschriften von Priene* (Berlin, 1907), with collection of references by ancient writers to the city; K. Baedeker, *Konstantinopel, Balkanstaaten, Kleinasien, Archipel, Cypern*, 401–408, with plan (2d ed., Leipzig, 1914). For the temple of Athena Polias, see Pullan and Newton, *Antiquities of Ionia*, published by the Society of Dilettanti (London, 1881). For the ancient history, see Lenschau, "De Rebus Prienensibus," in *Leipziger Studien*, vol. xii (Leipzig, 1890).

PRIESSNITZ, prēs′nĭts, Vincenz (1799–1851). The founder of hydrotherapy. He was born at Gräfenberg in Austrian Silesia and at first devoted himself to farming. It appears that a neighbor who had been in the way of healing trifling wounds on himself and others by means of cold water, treated Priessnitz in this way for a serious injury from the kick of a horse; and having had his attention directed to the virtues of cold water, Priessnitz, indisputably possessed of sharpness of intellect and some aptitude for the practice of the healing art, began to cure ailments with cold water and soon attained considerable reputation. As the number of applicants for advice went on increasing, he gradually evolved a system of treatment for the various cases presented. Opposition to him on the ground of unlicensed practicing gave way before special authority from the Austrian government, and in 1826 the Gräfenberg water cure was established. In 1833 Priessnitz abandoned farming in order to devote himself to the care of the establishments which he had to provide for the reception and treatment of his patients. A monument was erected in his memory in Gräfenberg in 1888. See HYDROTHERAPY.

PRIEST (AS. *prēost*, OF. *prestre*, Fr. *prêtre*, priest, from Lat. *presbyter*, elder, presbyter). The title, in its most general signification, of a minister of public worship, but specially applied to the minister of sacrifice or other mediatorial offices. In the early history of mankind there was no priest. The god was often a local object, like a stone or a river; the worship was simple, every one knew how to do it, and no priest was needed. The chief or the head of the family made the sacrifices, like Abraham in the stories of Genesis. Among the Aztecs, whose chief god was the sun, the king was high priest of the nation, all his family were regarded as sacred to the sun, and the women of the priest king were vestal virgins sacred to the god and the king. A survival of this stage of religion is the sacrifices to heaven in China, which can only be made by the Emperor. The priest, like the carpenter and the smith, arose from the division of labor. As the ritual grew more elaborate, it was necessary for some one to specialize in its knowledge; and as the priesthood grew, it tended to the elaboration of the ritual. At this stage the priesthood often became hereditary. At last it became necessary for a priest to be present at the ritual, while the offerer still performed the sacrifices. This is the stage found in the Vedic period in India. In most developed religions the priesthood has advanced a stage farther, and the priest himself performs the sacrifice, the offerer being only a spectator or sometimes not present at all. This opens the way for the priest to be regarded as the necessary mediator with the gods, without whom any approach to them would be impossible. The religion then becomes thoroughly sacerdotal. The origin of the priest is different from that of the shaman of Central Asia, the prophet or seer of Semitic religions, the wizard or medicine man of many other peoples. The seer is in communion with the gods or spirits primarily because of his experiences of ecstasy or of his possession of some occult power; the priest because of his knowledge of worship. The seer is an "inspired man," whose power is individual. The priest is an official, whose power is representative. Sometimes the two classes are in more or less open conflict, as were sometimes the priests and prophets of Israel. More often the priests absorbed the functions of the "inspired men" and took to themselves the positions of exorcist and oracle, as did the priests of Babylonia.

The chief formal priesthoods of antiquity, certainly those most elaborately developed, were those of the Hebrews, the Egyptians, and the Hindus. Compared with these, the priests of Greece and Rome formed a less compact social organization. (See GREEK RELIGION; ROMAN RELIGION.) The development of the priest and different ideas associated with his office are illustrated by the following account of the priesthood among the Hebrews, ancient Egyptians, and Hindus.

Hebrew and Jewish Priesthood. According to the later Jewish theory the priesthood belonged exclusively to the family of Aaron, while the remainder of the tribe of Levi held but the subordinate position of attendants at the sanctuary. But the examination of the historical records proves that this limitation of priestly prerogative was of late origin. The earlier strata of the historical books exhibit sacrifice as the right of all, especially of the heads of families. (Cf. the histories of the Patriarchs and of Manoah and Micah, Judg. xiii, xvii, xviii.) When the kingdom was organized the rights of the family chief passed to the king, and David (2 Sam. vi, where he is clothed with the priestly ephod) and Solomon (1 Kings viii; cf. ix. 25) take the part of priests. Also David's sons are said to have been priests (2 Sam. viii. 18). It was also the prerogative of national and religious leaders, of prophets like Samuel (1 Sam. xvi) and Elijah (1 Kings xviii). But from the beginning of the national history there existed a family or caste to which the priesthood was a profession—the so-called tribe of Levi, which may have taken to the priesthood because it had been able to obtain no land for its own possession and so must obtain a living among other tribes as best it could. Tradition made Moses a member of this tribe and gave the priestly functions to his brother Aaron.

The *locus classicus* for the position of the Levites in the early history is the story of Micah (see above), where, while a Levite is not necessary, he is much preferred; the Levite in question appears to be a grandson of Moses (Judg. xviii. 30, R. V.; see GERSHOM). Again, the priest at the ark in Shiloh is Eli, of the line of Ithamar, son of Aaron; doubtless this connection gave the Levites a prerogative in priestly functions, of which they were enabled to take advantage upon the settlement of the ark in Jerusalem and especially upon the building of the temple by Solomon. From this time on, it would seem, the sacerdotal functions of the religion of Yahwe in the Southern Kingdom came gradually to be monopolized by the Levites. The prestige of the temple naturally tended in Judah to the exaltation of a special priestly caste throughout that land, whose leading family were the priests of the royal temple at Jerusalem. As for the Kingdom of Israel, it is not stated (except in the doubtful passage 1 Kings xii. 31) whether the priests belonged to the Levites or not. During the monarchy hierarchical grades arose; thus, Abiathar of the line of Ithamar is the leading priest under David, to be dispossessed under Solomon by Zadok of the line of Eleazar. With the expansion of the caste and the growth of the sacred ritual, differentiations in office ensued, which resulted in the sacrificial functions being reserved for "the sons of Aaron," the remaining Levites, including Moses' descendants, being degraded to lower ministries. The Restoration immensely exalted the position of the priesthood, especially of its chief, the head of the family of Jerusalem priests. (Cf. Zech. iii, vi.) But it possessed no political force and little spiritual stimulus, so that it became a close corporation, intent upon enjoying and increasing its temporal privileges, leaving the development of religion in the hand of more popular leaders. The priesthood was raised to its highest honor through the assumption of the monarchy by the priestly Maccabæan family, so that for 70 years a priest king ruled Israel. (See MACCABEES.) With the fall of the Maccabæan kingdom and the destruction of that family by Herod, the priesthood fell back to its conventional position, becoming the tool of the Romans, who made and unmade the high priest. (Cf. Annas and Caiaphas in the Gospels; also Acts xxiii. 2 et seq.) It had a small but strong party behind its back in the Sadducees (q.v.), so named after the above-mentioned Zadok. With the destruction of the temple in 70 A.D. the priesthood ceased, as sacrifice was no longer legitimate. The tradition of the ancient caste is still faintly preserved in certain Jewish families.

As for the functions of the priesthood, in addition to the sacrificial acts, which were accompanied with blessing and prayer, there was the important office of the divine oracle, for which the instrument of Urim and Thummim (q.v.) was used, in all kinds of questions. (Cf. the histories of Saul and David.) Also in early times the priests at the various sanctuaries possessed the right of giving the *torah* or instruction of God in all matters. (Cf. Deut. xvii. 8 et seq.) With the codification of the law the teaching function passed from the priests to the more zealous lay expounders, the Scribes (q.v.). The support of the priests came in earlier times directly from the worshipers; they had the right to certain portions of the sacrifices, to the tithes, and other offerings. (Cf. 1 Sam. ii. 12 et seq.; Neh. x. 32 et seq.) Later there was established a more definite provision for the support of the temple and its priests in a poll tax levied upon all Jews. (Exod. xxx. 13; Neh. x. 32; cf. Matt. xvii. 24, R. V.) The number of the priests grew to vast proportions, according to Josephus over 20,000, and they were divided into 24 classes (1 Chron. xxiv), the individuals coming up to Jerusalem at their appointed seasons. (Cf. Luke i.) The priests alone had access into the Holy Place, the high priest alone into the Holy of Holies. For the dress of the priests, see Ex. xxviii; for general regulations, Lev. xxi, and passim in the Priestly Code. This history well illustrates the growth of priesthood, its tendency to a monopoly of worship, and its loss of leadership through formalism and the security of hereditary position. See AARON; HIGH PRIEST; LEVITE.

Egyptian Priesthood. From the earliest times each Egyptian nome had its own local cult administered by a priesthood who formed a sort of collegiate body and were divided into several classes. Every person of rank had a place in the worship. The highest class were the priests called by Egyptians *ḥen nuter* (servants of the god). Their functions are not very clearly defined, but it would seem that they conducted the temple services with the aid of the inferior clergy and delivered the oracles of the god. The duty of the *kheri-ḥeb* (he with the book) or "reciter priest" was to recite from the ancient sacred books, and he usually officiated at funerals, where he read over the deceased the appropriate chapters of the Book of the Dead (q.v.). As these old religious texts were believed to possess magical powers, the *kheri-ḥeb* came to be regarded by the people as a magician. Lowest in order of rank stood the *we‛b*, a name which signifies "pure." The we‛b was required to examine into the purity of sacrificial animals before they were laid upon the table of offerings; he also poured out drink offerings and performed the rites of ceremonial purification by sprinkling with holy water. At the head of the priestly college of each nome stood the chief prophet or high priest, who was usually, though not necessarily, the ruler. During this period the number of professional priests was relatively small, and besides the high priest, who was usually a layman, there were brotherhoods of pious laymen, termed *Unnut* (hour priests), attached to the various temples. Each member devoted a certain portion of his time to the temple services, and the association took part in a body on stated occasions. Nobles and high officials usually held one or more priestly offices, but it is probable that in the majority of cases their duties were more or less perfunctory. The funerary chapels attached to the tombs of important personages were served by priests entitled "servants of the Ka" (*ḥen ka*), and in the temples connected with the pyramids of Egyptian kings the worship of the deceased monarchs was conducted by priests styled "prophets of the pyramid."

Under the New Empire the position of the priesthood changed considerably, though to a less extent in the smaller country temples and in the ancient sanctuaries than in the great temples of the new capital, Thebes. The priesthood of Ammon, which may be considered as fairly representative of the later period, contained five gradations of rank: the first, second, and third prophets, the divine father, and the we‛b. The high priest or first prophet of Ammon held a very exalted position; he not only directed the affairs of the great national sanctuary, at the head of which he stood, but also exercised a sort of pontificate over all the temples of Egypt. The second prophet of Ammon had, among other duties, the superintendence of the artists belonging to the temple, and the we‛b officiated as "reciter priest." The priestly office was no longer hereditary, as in the older period, and, though the sons of priests often followed their fathers' profession, this was largely due to personal or family influence. A young man might be appointed to the priesthood in his fifteenth or sixteenth year, and his subsequent progress depended upon his abilities and upon the influence he could exert. The priests arrogated to themselves power and gathered wealth and often played an important part in Imperial politics.

Priests of all classes were bound to observe rigid personal cleanliness. They shaved their heads, wore pure linen garments, and, in case of contact with anything ceremonially unclean, must perform the necessary rites of purification before they could exercise their sacred functions.

In the older period noble ladies frequently bore priestly titles; they were usually prophetesses of Neith or Hathor, though to what extent they actually took part in the temple services it is difficult to say. It is probable that such titles were chiefly honorary. Under the New Empire women of all ranks were connected with the various temples, especially that of Ammon of Thebes, as singers or musicians. They were regarded as forming the harem of the god and held different degrees of rank. Certain women of high rank, e.g., bore the title of "chief concubine" of the god, and at the head of the mystical harem of Thebes stood the "legitimate wife of the god," usually the Queen herself, who represented the goddess Mut, the heavenly consort of Ammon.

Connected with the Serapeum (q.v.) of Memphis and with other temples of Serapis in Egypt was a regularly organized monastic system. The monks lived in cells, which they were not permitted to leave, and received their food through air holes in the wall, their sole channel of communication with the outer world. They called each other brethren and sought by pious meditation to overcome their passions and attain a condition of insensibility to external impressions. See EGYPT.

Hindu Priesthood. The growth of a priest caste can be traced in the history of Hindu literature. Originally a king, or paterfamilias, whether of priestly caste or not, could offer sacrifice. Then priests who knew the ritual and the Vedic hymns must be present. In the Brahmanic period the magical value and the elaboration of sacrifices were multiplied. Any defective performance of the sacrificial rites was supposed to entail the most serious consequences both in this life and in the future. As the duration of a Hindu sacrifice varied from one day to a year, or even more, the number of priests required at such a ceremony likewise varied. Again, as there are sacrificial acts at which verses from the Rig-Veda only were recited, others requiring the inaudible muttering of verses from the Yajur-Veda only, others, again, at which verses only of the Sama-Veda were chanted, and others, too, at which all these three Vedas were indispensable, there were priests who merely knew and practiced the ritual of the Rig-Veda or the Yajur-Veda or the Sama-Veda, while there were others who had a knowledge of all these Vedas and their rituals. The full contingent of priests required at a great sacrifice amounts to 16. Other inferior assistants, such as the ladle holders, slayers, choristers, and the like, are not looked upon as priests. From one to four priests sufficed at the minor sacrifices, or those of daily occurrence. The power of the priests became absolute. They monopolized all approach to the gods. For the common people they took the place of gods. "There are two kinds of gods; the gods are gods, and the priests who perform the sacrifices, they also are gods." No one needed to worship the gods; to fee the priests was sufficient. The gods themselves lived upon sacrifices. The sun would not rise if the priests did not sacrifice. It is not surprising that under this extravagant sacerdotalism the old Vedic gods were obscured, and a new ritual god, Brahman, the god of prayer, took the chief place. The priesthood became hereditary and belonged only to the Brahman caste, who claimed for themselves the first rank in society and almost divine honors. No country in the world so well illustrates the outcome of the unrestricted growth of priestly power as does India. In other lands the state has at least struggled to keep the priesthood within bounds; here the priesthood remained supreme. The only restriction was in the growth of monastic sects like Buddhism and Jainism, in which priesthood found no place. In these, however, the monks were later transformed into priests, since they knew the rites which developed in the originally simple religion or were borrowed from priestly faiths. For the priesthood of the Buddhists, Jainas, and Tibetans, see BUDDHISM; JAINISM; LAMAISM.

In the history of the Christian Church the question of the existence of a priesthood properly so called has given rise to fundamental divisions. The real problem in the Christian Church is whether the religion has any room for a special, authoritative class of mediators, to stand between God and man, or whether all Christians are alike priests, each able to come into the presence of God and present for himself his own prayers. It is essentially the old strife between prophet and priest; between religion as a personal relation to God and religion as an official ceremonial, in which God should be approached through the proper representative appointed by him. On the one hand, Roman Catholic theologians contend that the Apostles were definitely made by Christ partakers of his mediatorial priesthood, with power to hand it down to their successors (cf. John xx. 21), and assert that from the date of this commission there has been an unbroken tradition of sacerdotal power, whose most important function is the offering of sacrifice for the living and the departed (see MASS); that the Christian ministry is as truly a priesthood as that of the Jewish law, though with higher functions. There is a sense in which they admit this priesthood to be shared by the whole body of the faithful; but its specific exercise they claim is strictly limited to those who have been set apart by episcopal ordination. The Protestant bodies generally deny the existence of any such class or powers and have therefore usually abandoned the use of the word "priest," substituting for it "presbyter" or "minister"—though Milton, dissatisfied with the thoroughness of the English Reformation, complained that "New presbyter is but old priest writ large." See APOSTOLIC SUCCESSION; BISHOP; ORDERS, HOLY.

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PRIEST′LEY, JOSEPH (1733–1804). An English chemist and clergyman. He was born March 13, 1733, at Fieldhead, Yorkshire, the son of Jonas Priestley, a woolen-cloth dresser. At six years of age, because of his mother's death, he was adopted by his father's sister. In languages he mastered Latin, Greek, Hebrew, Italian, French, German, Chaldee, and Syriac. He also had a mathematical mind and was given to scientific research. From 1752 to 1755 he attended the Nonconformist Academy at Daventry, where he joined freely in theological discussions and found himself always on the heterodox side of the questions at issue. He announced himself a necessitarian and finally became a Socinian and denied the deity of Jesus Christ. Despite his unorthodox views, however, and a serious impediment in his speech, he sought the ministry, beginning at 22 years of age with a small congregation at Needham Market in Suffolk. While there, he wrote *The Scripture Doctrine of Remission*, published in 1761. From Needham he went to Nantwich, and thence to Warrington, where he was appointed a teacher of languages and belles-lettres in a Nonconformist academy. Here he married and spent six of the happiest years of his life. The University of Edinburgh gave him an honorary degree in recognition of his literary work, and he became acquainted with Franklin and Price.

While living next door to a brewery in Leeds, whither he had removed to take charge of Mill Hill Chapel, Priestley became interested in the production of carbonic acid and succeeded in forcing it into water. He also wrote a *History of Electricity* and afterward published political tracts and papers, some of which were opposed to the government's attitude towards the American Colonies. In 1772 he became librarian and "literary companion" to Lord Shelburne at a salary of £250 a year and in 1774 accompanied him on a tour in France and Germany. About this time he wrote the *Letters to a Philosophical Unbeliever* and other works criticizing the doctrines of Hume and others. It was in 1774, also, that Priestley first produced oxygen. This discovery, one of the greatest in the history of science, made it possible for Lavoisier correctly to interpret the process of combustion, to cast out of scientific thought the concept of phlogiston, and to place chemistry on a true foundation. Priestley himself, unfortunately, failed to realize the consequences of his discovery, and even after they had been pointed out clearly by his illustrious contemporary (who, however, was his inferior as an experimenter) he refused to abandon the phlogistic doctrine. In 1777 he published his *Disquisition Relating to Matter and Spirit.* This led to the severance of his relations with Lord Shelburne, and in 1780 he became the minister of a dissenting chapel at Birmingham. Here he made the acquaintance of James Watt and of Dr. Darwin, the grandfather of Charles Darwin, and here he carried on his celebrated controversy with Bishop Samuel Horsley, in which he was the recognized champion of Socinianism. His reply to Edmund Burke's *Reflections on the French Revolution* led to his being made a citizen of the French Republic and unhappily resulted in his house and chapel being burned by a mob and all his books, manuscripts, and scientific instruments being destroyed. This occurred in 1791, and because of the attack he left Birmingham and took up ministerial work at Hackney, London. He preached there for three years, and then, in 1794, removed to America, whither his sons had emigrated the year before. He settled at Northumberland, Pa., and spent the rest of his life there. He preached and lectured occasionally, but his services were not in great demand and his oratorical powers were failing. He declined the offer of a professorship of chemistry at Philadelphia and later the principalship of the University of Pennsylvania. Most of his time was spent with his books and in scientific experiment, and he continued to write till the time of his death, although his later years were clouded by the physical infirmities of age. He died Feb. 6, 1804.

Priestley was in many ways a remarkable man. He presented the unusual combination of theologian, scientist, and politician. His manifold and varied publications gave evidence of the scope of his genius. His pen was untiring. In religion and in politics he was a radical, but he was a sincere seeker after truth and a man of unblemished reputation and irreproachable moral character. His *Theological and Miscellaneous Works* and *Memoirs and Correspondence* were collected and edited by John T. Rutt—the former in 26 vols. (London, 1817–32), the latter in 2 vols. (ib., 1831–32). The edition contains more than 130 separate works, varying in size from short pamphlets to four-volume treatises, and the subjects treated cover a vast range. Consult: Leslie Stephen, in *History of English Thought in the Eighteenth Century* (3d ed., New York, 1902); Thorpe, *Joseph Priestley*, in "English Men of Science Series" (ib., 1906); J. H. Muirhead, in *Nine Famous Birmingham Men* (2d ed., Birmingham, 1909). His *Memoirs* were edited by Cooper and Christie (2 vols., London, 1906).

PRIETO, prē-ā′tō, JOAQUÍN (1786–1854). A Chilean politician and soldier, born at Concepción. Although at first a Royalist, he took the patriot side in 1811 and was foremost in the fight for independence. After the war he served as member of the Congress and Senate. In the Civil War of 1829–30 he defeated Friere at the battle of Lircay (1830) and was made provisional President of Chile. This appointment was ratified six months afterward, and he was reëlected President in 1836, but retired in 1841. During his administration a new constitution (1833) was adopted and many reforms were introduced, especially in public instruction. He later held several offices.

PRIGG vs. PENNSYLVANIA. An important case decided in 1842 by the Supreme Court of the United States, which defined the rights and duties of the various States with reference to the rendition of fugitive slaves. In 1826 Pennsylvania passed a law against kidnapping which imposed severe penalties upon any one who should remove any negro from the State with the intention of reducing or returning such slave to a condition of slavery. In 1837 a slave woman, Margarette Morgan, who five years before had escaped from her owner in Maryland into Pennsylvania, was seized by one Edward Prigg, the attorney of her owner, without the simple process provided by law, and, together with her children, was delivered to her mistress. Prigg was thereupon tried and convicted of kidnapping in the court of York Co., Pa., and the decision of this court was confirmed by the Supreme Court of Pennsylvania, to which Prigg appealed. The case was then carried before the Supreme Court of the United States, which, by a vote of five to four, reversed the earlier decisions and, among other things, decided (1) that by the Constitution the national Congress had the exclusive right to legislate concerning the rendition of fugitive slaves; (2) that the legislatures of the various States had no power to pass legislation upon this subject; (3) that Pennsylvania's Law of 1826 was therefore void; (4) that "the owner of a slave is clothed with entire authority in every State in the Union to seize and recapture his slave, whenever he can do it without any breach of the peace or any illegal violence"; and (5) that no State could be compelled to aid the enforcement of a United States law on this subject. Though the right of slave owners to their fugitive slaves was unequivocally confirmed, this decision has been regarded by many as in one respect a "triumph of freedom," since it relieved the various free States of any necessary participation in the catching and returning of fugitive slaves and encouraged them to pass laws, known as "Personal Liberty Laws," prohibiting all State officials, under heavy penalties, from aiding slave catchers in any way and forbidding the use of State jails for the detention of captured fugitives. Consult J. B. Thayer, *Cases on Constitutional Law*, vol. i (Boston, 1895).

PRILLIEUX, prė'yẽ', Edouard Ernest (1836–1915). A French botanist, born in Paris. In 1877 he was appointed professor of botany at the Institut National Agronomique; in 1883 he was made inspector general of agriculture and in the same year became an Officer of the Legion of Honor. In 1897 he was elected Senator from the Department of Loir-et-Cher and in 1899 a member of the Académie des Sciences. His publications include articles on vegetable parasites, contributed to various French periodicals, and *Maladies des plantes agricoles et des arbres fruitiers et forestiers, etc.* (1895–97).

PRILUKI, prė-lo͞o'kė. A district town in the Government of Poltava, Russia, situated 145 miles northwest of Poltava (Map: Russia, D 4). It has a considerable milling industry and trades in the agricultural and animal products of the neighborhood. Pop., 1911, 30,485.

PRIM, prēm, Juan, Marquis de los Castillejos, Count de Reus (1814–70). A Spanish general and statesman. He was born in Reus, Catalonia, entered the army at an early age, rendered Narváez (q.v.) efficient assistance in securing the downfall of Espartero in 1843, and was made Count. He was active in bringing about the return of Queen Christina, but in 1844, on account of his defection from Narváez, was sentenced to imprisonment on a charge of conspiracy against the latter's life. In 1845 he was pardoned by the Queen, who made him Governor of Porto Rico. He led the progressive party in the Cortes (1848–53), was in exile (1853–58), and served in the campaign in Morocco (1859–60). For his victory at Los Castillejos, Jan. 1, 1860, he was made Marquis and Grandee. In 1862 he was commander of the Spanish troops in Mexico, dispatched to act in conjunction with the French and English forces, but, disapproving of the plans of the Emperor Napoleon, he returned to Spain, where the Cortes sanctioned his course. In 1864 he was driven from Madrid, accused of participating in a military conspiracy, and in 1866 he began an unsuccessful insurrection against the government of O'Donnell (q.v.) and was forced to flee to England. In 1868 he joined Serrano in the revolution which dethroned Isabella. In the provisional government (October) Prim became commander in chief, Minister of War, and President of the Council. He was responsible for the choice of Prince Leopold of Hohenzollern to fill the vacant throne, a choice which brought on the Franco-German War (q.v.). Afterward, through his agency, Amadeus I (q.v.) was called to the throne. Prim was shot by an assassin Dec. 28, 1870, and died from his wounds on the 30th, before Amadeus arrived in Madrid. Consult: Louis Blairet, *Le général Prim et la situation actuelle de l'Espagne* (Paris, 1867); Guillaumot, *Juan Prim et l'Espagne* (ib., 1870); H. Leonardon, *Prim* (ib., 1901), with a bibliography.

PRI'MARY ELECTION (Lat. *primarius*, relating to the first or earliest, from *primus*, first, from *pro*, before; connected with Gk. *πρό*, *pro*, Skt. *pra*, Goth. *faúr*, OHG. *fora*, Ger. *vor*, AS., Eng. *for*). The term used to designate the means through which candidates for elective offices are nominated. In a more restricted sense it is applied to formal elections, either of delegates to nominating conventions or of party nominees. In either case only party members are entitled to a vote in the primaries. In certain municipalities the nonpartisan primary is in use. Here the whole electorate may take part in selecting the candidates later to be voted upon in the regular elections. Until recently the primary election was a wholly extralegal institution, i.e., it was unregulated by statute. Each party framed its own rules and devised its own machinery for the selection of its candidates without legal restriction. The theory was that whatever political action antedated the election was beyond the domain of law, and hence the manner in which each party brought forward its candidates was to be determined by its own action. Every proposal to place the primary under the supervision of the State was attacked as a species of despotism repugnant both to the liberty of parties and to the private rights of politicians. For a long time the non-officially conducted primary was the source of little or no abuse, but with the enormous growth of the city population and the complexity of political life in general the opportunities for fraud and corruption multiplied so that in many communities, especially in the larger cities, the primary degenerated into a confederation of selfish partisan associations from which a large majority of the voters were excluded. In the decade 1890–99 the progress of reform was rapid. By the end of the decade primary elections were regulated by law in two-thirds of the States. In general these laws provided that sufficient public notice should be given; that the elections should be by ballot; that the election officers should be sworn; that the expense of conducting the primaries should be borne by the State or in some cases, as in Mississippi, by the candidates; that frauds should be punished according to prescribed penalties; and that these requirements should be compulsory in the large cities and optional elsewhere. After 1900 the primary reform movement takes a new direction. Instead of serving chiefly to select delegates to convention with power to make nominations, the direct nomination of candidates by the general voters came to be the ideal of the movement. In 1915 the direct primary had come to be practically the universal mode of selecting either State or local nominees, or both, throughout the United States. In addition, the nomination of candidates for Congress and for the United States Senate was generally subject to direct primary laws. In 1910 Oregon provided for a preferential vote for presidential candidates, and in 1911 New Jersey, North Dakota, Nebraska, Wisconsin, and California adopted this plan. The following two years saw the adoption of the plan by 11 more States. In the presidential elections of 1912 presidential primaries were held in many States under the auspices of the parties without having been provided for by law.

The movement for primary reform has been essentially a reaction against the convention system. The choice of candidates by convention had degenerated often to selection by party bosses. It was believed that through primary reform the power of the boss could be broken. This has not in fact resulted, but there can be little doubt that the new system has forced the boss to be somewhat more regardful of the general party opinion. The system has increased the cost of elections and according to its opponents deterred the most desirable civic types from entering political life, since they do not possess the power of appeal to the masses needed to secure nomination under the primary system. Consult: C. E. Merriam, *Primary Elections* (Chicago, 1908); C. E. Fanning, *Select Articles on Direct Primaries* (3d ed., Minneapolis, 1911); McLaughlin and Hart (eds.), *Cyclopedia of American Government*, vol. iii (New York, 1914). See Caucus; Convention; Election.

PRIMARY QUALITIES. Those qualities which are in some systems of philosophy supposed to belong to the object as it is in itself apart from its appearance in some one's perception of it. Secondary qualities are supposed to belong to the object only as it appears in consciousness. Various lists of primary qualities have been given. Locke's list includes "solidity, extension, figure, motion or rest, and number." The distinction between primary and secondary qualities appears in most realistic systems of philosophy. See Knowledge, Theory of; Realism.

PRI′MATE (Lat. *primas*, chief, from *primūs*, first). A title in some of the Christian churches applied to a bishop as first in a province or group of provinces. A metropolitan is a primate as presiding in his province, or one of several metropolitans as presiding over others. The title does not seem to have come into ordinary use until the ninth century, after which it was given to the metropolitans of certain sees as the special representatives of the Pope. It strictly belongs to the Latin church, but in its general use it corresponds with that of exarch in Eastern churches. In early usage the primate, as such, was the head of a particular church or country and held rank, and in some churches a certain degree of jurisdiction, over all the archbishops and bishops within the national church. This jurisdiction, however, was confined to the right of visitation and of receiving appeals. In England, as a settlement of the quarrels between Canterbury and York, the Pope designated the Archbishop of Canterbury as primate of *all* England, while the Archbishop of York was to be known as primate of England. At present in the Catholic church the title, when used, is by special favor and confers no right over other prelates.

The title of primate is also given to several bishops of the Church of England in the British colonies. In the Episcopal church of Scotland the title *primus* is given to the presiding bishop. He is chosen by vote of all the bishops without their being bound to give effect to seniority of consecration or precedency of diocese. See Metropolitan; Patriarch.

PRIMA′TES (Lat., chiefs). The highest order of mammals, including man, monkeys, and lemurs (qq.v.). They are characterized by the presence of well-developed clavicles, two pectoral mammæ, and orbits directed forward, encircled by bone and shut off from the temporal fossæ. The innermost digit of the hands and feet are usually opposable to the others; this is always so in at least one pair of limbs. The terminal joints of the digits bear flat nails, rarely claws. The incisor teeth are typically two in each jaw, directly in front, and canine, premolar, and molar teeth are also present. The brain (except in lemurs) exhibits a high type of structure, the cerebrum being very large and covering the cerebellum, and the surface of the former is much convoluted. Excepting man, the Primates are arboreal forms and are peculiarly well fitted for such a life. The tail is often long and sometimes prehensile. They are mostly small or medium-sized animals, though some of the anthropoid apes are large. They are omnivorous eaters, but fruit, berries, and other vegetable matter form a large part of their diet. The order is easily divided into two distinct suborders, the Lemuroidea and Anthropoidea—the former containing only lemurs and their near allies, spectres, pottos, aye-ayes, etc. (qq.v.), while the latter includes all the marmosets, monkeys, baboons, apes, and man (qq.v.). Consult D. G. Elliot, *A Review of the Primates* (3 vols., New York, 1913).

PRIMATICCIO, prē′mȧ-tē̇t′chō̇ (called by the French "Le Primatice"), Francesco (1504–70). An Italian painter, sculptor, and architect. He was born in Bologna and was the pupil of Innocenzo da Imola and Bagnacavallo, but was mainly influenced by Giulio Romano, his next master, whom he assisted in the decorations of the Palazzo del Tè in Mantua. Later he was influenced also by Michelangelo and Correggio. In 1532 he was called by Francis I to France and with Rosso was employed at Fontainebleau. He succeeded Rosso as director of works there and before Francis's death had executed his most important frescoes in the Gallery of Ulysses, destroyed when the palace was remodeled in 1738. As his other work at Fontainebleau has been freely restored, his style, distinguished by beauty of modeling, grace, and invention, but spoiled by affectation and mannerisms, can best be judged of from his drawings, many of which are in the Louvre and the Stockholm Gallery. In 1544 he was made abbé of St. Martin of Troyes, and Catharine de' Medici appointed him court architect, in which capacity he made designs for the Valois tombs at Saint-Denis. His activity at Fontainebleau resulted in the formation of the so-called school of Fontainebleau, which greatly promoted the Italian influence on French art. Consult Dimier, *Le Primatice* (Paris, 1900).

PRIME. See Breviary.

PRIME, Edward Dorr Griffin (1814–91). An American clergyman and journalist. He was born at Cambridge, N. Y., and graduated from Union College in 1832. He graduated from Princeton Theological Seminary in 1838 and had pastorates at Scotchtown, N. Y., and New York City. In 1853 he became substitute editor of the New York *Observer*, while his brother, Samuel Irenæus Prime (q.v.), was in Europe. Afterward the two were associated until 1885. Edward Prime continued to edit the paper for a year after his brother's death. He traveled much abroad, spent the winter of 1854–55 in Rome, and made a journey round the world in 1869–70 to study religious conditions in Eastern countries. He published: *Around the World* (1872); *Forty Years in the Turkish Empire; or Memoirs of Rev. William Goodell* (1876); *Civil and Religious Liberty in Turkey* (1875); *Notes . . . of the Prime Family* (1888).

PRIME, Samuel Irenæus (1812–85). An American clergyman, traveler, and writer. He was born at Ballston, N. Y., and graduated from Williams College in 1829. Three years later he entered Princeton Theological Seminary, was licensed to preach in 1833, and in 1835 was installed pastor of the Presbyterian Church at Ballston Spa, N. Y. For a time he was principal of the academy at Newburgh, N. Y. In 1840 he entered upon the chief work of his life as editor of the New York *Observer*, a paper of which he afterward came to be the principal owner. His brother and then his son, Wendell Prime, carried on the editorship after his death. He was the founder of the New York Association for the Advancement of Science and Art, president and trustee of Wells College, and a trustee of Williams College. Besides a large number of books of religious character he published: *Life in New York* (1846); *Travels in Europe and the East* (1855); *Letters from Switzerland* (1860); *American Wit and Humor* (1859); *The Alhambra and the Kremlin* (1873); *Life of Samuel F. B. Morse* (1875); *Irenæus Letters* (1880, 1885). Consult the autobiography in *Irenæus Letters* (2d series, New York, 1885), and E. D. G. Prime, *Notes . . . of the Prime Family* (ib., 1888).

PRIME, William Cowper (1825–1905). An American journalist, brother of S. I. Prime and of E. D. G. Prime, born at Cambridge, N. Y. He graduated at Princeton in 1843, was admitted to the bar and practiced law in New York City until 1861, when he became part owner and editor in chief of the New York *Journal of Commerce.* In 1869 he gave up his editorial work and revisited Egypt and Palestine, where he had spent some time in 1855–56. It was at his instance that Princeton in 1884 established a chair of the history of art. Of this he became the first incumbent. His interest in art matters brought him into close connection with the Metropolitan Museum in New York, of which he was first vice president after 1874. He wrote: *The Owl-Creek Letters* (1848); *The Old House by the River* (1853); *Boat Life in Egypt and Nubia* (1857); *Tent Life in the Holy Land* (1857); *Coins, Medals, and Seals, Ancient and Modern* (1861); *Pottery and Porcelain of All Times and Nations* (1878); and the hymn "O Mother dear, Jerusalem" (1865). He also edited *McClellan's Own Story* (1886).

PRIME MERIDIAN CONFERENCE. See Time, Standard.

PRIME MINISTER. See Ministry.

PRIM'ER. See Hours, Book of.

PRI'MER. A device for igniting the propelling charge in firearms or artillery. Cannon were first ignited by red-hot irons or port fires applied to loose powder on the vent (touchhole). These were replaced by slow match, and later the powder was put into tubes or quills for insertion into the vent. In 1782 flintlocks were used upon naval cannon. Friction composition was invented in 1807, and a few years afterward percussion caps were introduced for cannon. Later, and to a certain extent at present, friction primers were used. A copper tube extending into the vent holds an explosive charge which is ignited by pulling a roughened wire through the friction composition in a housing in the outer end of the tube. This has been largely displaced by fulminate caps set in the bases of metallic fixed-ammunition cases and exploded by percussion or electricity. In percussion primers a firing pin strikes the fulminate of mercury which rests on an anvil. In electric primers the current heats a fine platinum wire set in guncotton. See Cartridge; Guns, Naval; Ordnance; Small Arms.

PRIMES (from Lat. *primus*, first). One of the two classes into which integers are divided according to divisibility. Integers that are not exactly divisible by any integer except themselves and one are called *primes,* all others being called *composite* numbers. Thus, 1, 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, ... are primes. Two integers are said to be prime to each other, or relatively prime, when they have no common factor except unity. Thus, 11 and 21, 15 and 32, 23 and 48 are relatively prime. One of the earliest and best-known methods of selecting primes is the sieve of Eratosthenes (200 B.C.). This consists in writing down all the odd numbers from 3 on and then striking out all the multiples of 3, 5, 7, ... Tchebichev (1850) was the first to reach any valuable conclusions in the way of ascertaining the number of primes between two given limits. Riemann (1859) also gave a well-known formula for the limit of the number of primes not exceeding a given number. Consult Lehmer, *Factor Table for the First Ten Millions* (Washington, 1912), and *Tables Giving a Complete List of Prime Numbers between the Limits 1 and 10,006,721* (ib., 1913). See Number.

PRIMITIÆ. See First Fruits.

PRIM'ITIVE BAPTISTS. See Baptists, *Baptists, Old School, or Primitive.*

PRIMITIVE METHODIST CONNECTION. See Methodism.

PRIMITIVE SOCIETY. See Gens; Marriage; Society; Sociology; Tribe.

PRIMO, prē'mō (It., first). A term used in music with the following significations: in four-hand arrangements for piano the music played by the performer of the treble part is marked *primo,* that played by the performer of the bass, *secondo; prima donna,* the leading female singer (soprano); *prima vista,* at first sight; *prima volta* (abbreviated I) is always followed by a bracket extending over one or more measures before a *repeat* begins; *tempo primo* denotes a return to the original rate of speed; *primo uomo,* the leading male singer (first tenor or soprano). This last term is no longer used, but was in general use during the seventeenth and eighteenth centuries, when in Italy the principal rôles in operas were written for and sung by male sopranos.

PRI'MOGEN'ITURE (ML. *primogenitura,* from Lat. *primogenita,* rights of the first-born, neut. pl. of *primogenitus,* first-born, from *primus,* first + *genitus,* p.p. of *gignere,* to produce). In the law of inheritance, the right of the first-born to take by descent the real property of a deceased ancestor, to the exclusion of all others of equal degree of consanguinity. The term has sometimes been employed in a wider sense to describe any priority which, in various legal systems, the law has accorded to the first-born, thus comprehending the birthright of the

Hebrew and of Hindu law (where that belonged, as was not always the case, to the eldest son), which was at the most a right to a double portion of the inheritance, as well as the right of the eldest of the heirs in certain forms of Anglo-Saxon tenure to the chief house (*mansio*) of the ancestor. But the term is in modern law usually restricted to the persistent rule of inheritance which has for centuries maintained itself in our common-law system, whereby the eldest son or his issue, or, failing lineal descendants, the eldest male in the next degree of consanguinity, takes all the real estate of which his ancestor died seised and intestate, to the exclusion of all female and of junior male descendants of equal degree. Although not confined to lineal descendants, but comprehending the remotest degrees of consanguinity, the principle of primogeniture has never in the common law of land been applied to female heirs, who have, whether lineally or collaterally descended from their common ancestor, always been permitted, in default of male heirs, to share the inheritance equally.

This rule of descent, due, in its origin, to the exigencies of the feudal system, was formerly common to feudal Europe, but it has long since disappeared everywhere but in England. It has not generally been adopted in the English-speaking colonies of Britain, and though introduced with the rest of the common-law system into the American Colonies, it was abrogated and abandoned by them at an early period in their history. Consult: Sir H. J. Maine, *Lectures on the Early History of Institutions* (7th ed., London, 1897); Sir William Blackstone, *Commentaries on the Laws of England* (4th ed., 2 vols., Chicago, 1899); Pollock and Maitland, *History of English Law before the Time of Edward I* (2d ed., 2 vols., Cambridge, 1903); Sir H. J. Maine, *Ancient Law* (4th Amer. ed., New York, 1906); and the authorities referred to under REAL PROPERTY. See DESCENT; INHERITANCE; BOROUGH ENGLISH.

PRIMORSKAYA, prē-môr′skȧ-yȧ. The Russian name of the Maritime Province (q.v.) in Siberia.

PRIMROSE, ARCHIBALD PHILIP. See ROSEBERY, EARL OF.

PRIM′ROSE, CHARLES. The vicar in Goldsmith's *Vicar of Wakefield*.

PRIMROSE FAMILY. A popular name for a family of plants. See PRIMULACEÆ.

PRIMROSE LEAGUE, THE. A political league founded in London in 1883 in support of the principles advocated by the Earl of Beaconsfield (see DISRAELI), the name being adopted, it is said, on account of a preference shown by him for that flower. The membership includes both sexes, and the titles applied to members are Knight and Dame.

PRIM′ULA (ML., fem. of Lat. *primulus*, dim. of *primus*, first; so called in allusion to the early bloom), PRIMROSE. A genus of plants of the family Primulaceæ, comprising about 200 species, mostly perennials, generally having only radical leaves and bearing the flowers in an umbel, more rarely solitary, on a scape. This genus is indigenous to North America, Asia, and Europe, and more than half the number of species are native to the Himalaya, China, and Japan. Two small unimportant species are found in eastern North America, with quite a number in the Rocky Mountain and Pacific coast States. Their fine colors and soft, delicate beauty have led to the cultivation of some of the species, and numerous varieties and hybrid forms with single and double flowers of various tints have been developed. They are extensively grown in ornamental gardening and also as house and conservatory plants. The common primrose (*Primula vulgaris*) is abundant in woods, hedges, and meadows in most parts of Europe. It has spoon-shaped and deeply veined leaves and bears its yellowish-white blossoms on single-flowered scapes. It is the parent species of many cultivated varieties. The name "primrose" belongs especially to this species. The English cowslip (*Primula officinalis*) is allied to the common primrose, and the oxlip (*Primula elatior*) is an intermediate between the two species. These are among the earliest spring-blooming flowers. The Chinese primrose (*Primula sinensis*) is a popular ornamental plant in residences and conservatories and is commonly sold in flower markets. It is highly prized for its numerous large flowers of a variety of colors borne in umbels above the foliage. *Primula obconica* is another beautiful Chinese species, largely grown in conservatories for its numerous pale lilac or purple and sometimes nearly white blossoms. There are many hybrids and garden varieties of the different species. The garden primroses prefer a rich, moist, loamy soil, and shady positions. The greenhouse varieties are potted in light soil chiefly composed of leaf mold with some sand and loam. The varieties grown in the open are propagated by seed or by dividing the clumps. The seed is sown out of doors in summer, preferably in pans; the young plants are potted and kept in a cold frame or the greenhouse over winter. In the spring the plants are set out in the pots where desired. Sometimes strong seedlings are planted in the open directly from the seed pans. The tender varieties grown under glass are also increased by seeds and offsets started in the greenhouse. See AURICULA; POLYANTHUS; Plate of CRANBERRY; and Colored Plate of GREENHOUSE PLANTS. In America certain species of *Œnothera* (q.v.) are called evening primrose.

EUROPEAN WILD PRIMROSE (CULTIVATED FORM).

PRIM′ULA′CEÆ (Neo-Lat. nom. pl., from ML. *primula*, primrose), PRIMROSE FAMILY. A family of dicotyledonous herbs, containing about

30 genera and 400 species of wide distribution in the Northern Hemisphere, a few occurring in southern South America and South Africa. The flowers, often terminal on scapes, are regular, usually five-parted, and followed by capsular fruits. The most familiar genera are as follows. *Primula*, which gives name to the family, includes about 150 species, commonly known as primroses. *Samolus*, with about 10 species, includes the water pimpernels or brookweeds, the name indicating the nature of the habitat. *Lysimachia*, with about 70 species, includes the loosestrifes, among which is the commonly cultivated moneywort (*L. nummularia*). A very beautiful genus is the *Dodecatheon*, with about 30 species, commonly called shooting stars or American cowslips.

PRIMULIN. See COAL-TAR COLORS.

PRI'MUM MO'BILE (Lat., the first part movable). In the Ptolemaic system of astronomy, the tenth or outermost of the crystalline spheres, supposed to revolve from east to west every 24 hours, carrying the other spheres with it.

PRINCE (OF., Fr. *prince*, from Lat. *princeps*, from *primus*, first + *capere*, to take). An epithet which was originally applied to the *princeps senatus* of the Roman state and afterward became a title of dignity. It was adopted by Augustus and his successors; hence the word was afterward applied to persons enjoying kingly power. In various parts of continental Europe the title "prince" is borne by families of eminent rank, but not possessed of sovereignty; and in England a duke is, in strict heraldic language, entitled to be styled "high puissant and most noble prince," and a marquis or earl as "most noble and puissant prince." Practically, however, in England, the term "prince" is restricted to members of the royal family. In Germany and Austria the ambiguity of applying the same title to the members of the royal houses and princely families, not sovereign, is avoided, the former being styled "Prinz," the latter "Fürst." The German Fürst takes rank below the duke (Herzog). In France the title has frequently been borne by, e.g., the son of a duke, thus denoting no special rank or precedence.

PRINCE, JOHN DYNELEY (1868–). An American philologist, born in New York City. He graduated at Columbia in 1888, studied at Berlin in 1889–90, and obtained his Ph.D. at Johns Hopkins in 1892. He was professor of Semitic languages from 1892 to 1902 and dean of the Graduate School (1895–1902) at New York University, and thereafter held the chair of Semitic languages at Columbia until 1915, when he was transferred to the newly created chair of Slavonic languages. In 1906 and 1908 he was a Republican member of the New Jersey Assembly, of which he was Speaker in 1909, and in 1911–13 was a member of the New Jersey Senate, being its president in 1912. Prince was also acting Governor of New Jersey in 1912, and was an unsuccessful candidate for Congress in 1914. His publications include: *Mene, Mene, Tekel, Upharsin* (1893); *A Critical Commentary on the Book of Daniel* (1899); *Kulóskap the Master* (1902), with C. G. Leland; *Materials for a Sumerian Lexicon* (1908); *Assyrian Primer* (1909).

PRINCE, MORTON (1854–). An American neurologist and psychologist. He was born in Boston, graduated at Harvard in 1875 and at Harvard Medical School in 1879, and settled in his native city. From 1902 until 1912 he was professor of nervous diseases at Tufts College Medical School. In 1906 he became editor of the *Journal for Abnormal Psychology.* Dr. Prince was one of the alienists connected with the Thaw case. During the European War he made a study of the psychological effect on the soldier of his life. He is the author of *The Nature of Mind and Human Automatism* (1885); *Dissociation of a Personality* (1906); *The Unconscious* (1913); *Psychology of the Kaiser* (1915).

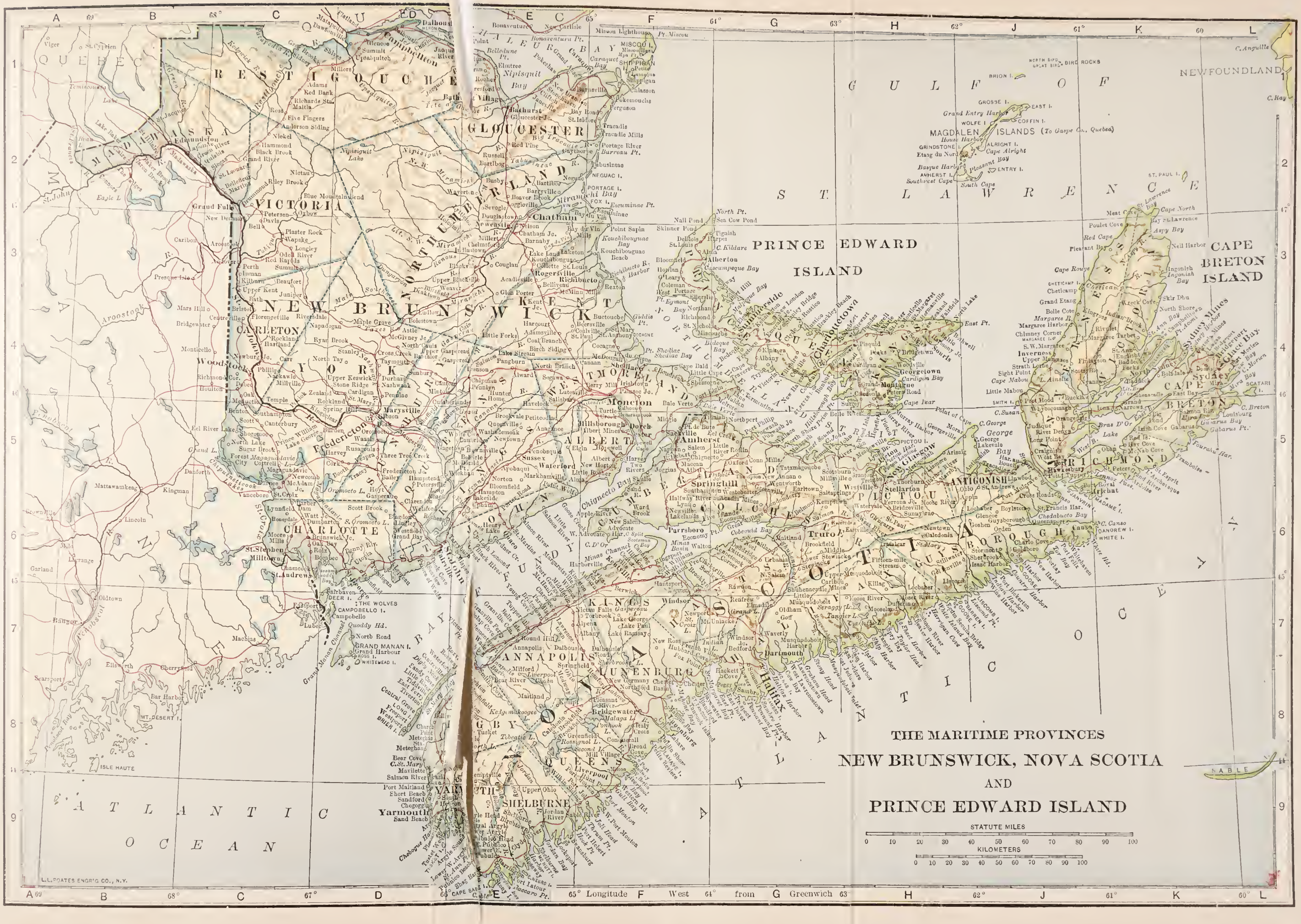
PRINCE, THOMAS (1600–73). See PRENCE, THOMAS.

PRINCE, THOMAS (1687–1758). An American historian, antiquary, and clergyman, born in Sandwich, Mass., of an old Colonial family. He graduated at Harvard in 1707, was ordained, traveled in the West Indies and England, and from 1718 till his death was connected with the Old South Church, Boston. In 1703 he began a collection of manuscripts and books on the history of New England, which were deposited in the Old South Church tower and which were partly destroyed by the British (1775–76). What remained forms the Prince collection in the Boston Public Library. A catalogue of the books was prepared by that institution in 1868, reëdited in 1870. Prince's chief work is *The Chronological History of New England* (1736–55, one volume and a portion of the second; new ed., 1826), which he was not sufficiently encouraged to complete. Thus it does not come beyond the year 1633, for a large portion was devoted to an abridged annalistic history of the world before the landing of the Pilgrims. Prince was so accurate, however, that what he wrote was of great value. Noteworthy, too, are his *Account of the English Ministers at Martha's Vineyard*, appended to Mayhew's *Indian Converts* (1727), and his *Earthquakes of New England* (1755). Some of his sermons also were published. As a scholar he probably surpassed all Colonial Americans save Cotton Mather.

PRINCE ALBERT. A city and the capital of the Prince Albert electoral district, Saskatchewan, Canada, on the North Saskatchewan River and on the Grand Trunk Pacific and Canadian Northern railways, 542 miles by rail northeast of Winnipeg (Map: Saskatchewan, E 4). The city is the seat of Anglican and Roman Catholic bishops, has a business college, a ladies' college, a Roman Catholic convent, an armory, a labor temple, two hospitals, Dominion lands office, a permanent land show building, a collegiate institute, a customs office, and is the headquarters of the Royal Northwest Mounted Police for central and north Saskatchewan. Industrial establishments include lumber companies, brickyards, flour mills, cold-storage plants, planing mills, saddlery works, marble and granite works, and manufactories of boats, culinary articles, etc. Pop., 1901, 1785; 1911, 6254; 1914 (police census), 13,450.

PRINCE ALBERT LAND. A large island of unknown area lying to the north of the Mackenzie district of Canada and constituting a part of the Canadian district of Franklin (Map: Canada, H 2). It is typically Arctic in its character and has been but little explored. Its southern portions are known as Victoria Land and Wollaston Land.

PRINCE EDWARD ISLAND. The smallest province of the Dominion of Canada. It is



THE MARITIME PROVINCES
NEW BRUNSWICK, NOVA SCOTIA
AND
PRINCE EDWARD ISLAND

situated in the southern part of the Gulf of St. Lawrence, being separated from New Brunswick and Nova Scotia by the Strait of Northumberland (Map: New Brunswick, G 3). Length, 130 miles; breadth, 4 to 30 miles; area, 2184 square miles. The island is composed of a soft red sandstone of Permo-Carboniferous and Triassic age, which wears easily, and on this account the surface is without strongly marked prominences and nowhere rises more than 500 feet above the sea. The coasts are generally low and sandy, but in some places there are bold cliffs, varying in height from 10 to 100 feet, composed of sandstone. The island is indented with numerous bays and inlets, several of which, as Cardigan Bay on the east, the approach to Georgetown, and Hillsborough Bay on the south, the approach to Charlottetown, are deep and spacious and afford safe anchorage for large vessels. The rivers are short tidal streams. The climate is very healthful, being milder than that of the continental regions in the vicinity and free from the fogs which prevail on Cape Breton and Nova Scotia.

Forests originally covered the entire island. About three-fourths of the area is now cleared. Aside from some of the boggy and swampy lands, the whole of the island is cultivable. The soil, which is well watered with numerous springs and rivers, rests upon red sandstone. It consists for the most part of a layer of vegetable matter above a light loam, which rests upon stiff clay above sandstone.

The agricultural products are more than the quantity required for local consumption. The natural fertility of the soil was injured by too great a succession of cereal crops, but it has been renewed through the application of mussel mud (a natural fertilizer dredged from the bays and rivers). In 1914 there were 32,000 acres of wheat, with a yield of 809,000 bushels; 183,000 acres of oats, with 7,596,000 bushels; 192,000 acres of hay, with 334,000 tons; 8000 acres of turnips, with 4,024,000 bushels; 32,000 acres of potatoes, with 6,806,000 bushels; 3800 acres of barley, with 119,000 bushels. Fruit does not flourish so well as in Nova Scotia. The island has long been noted for its large production of eggs; about 2,500,000 dozen were exported in 1913. Dairy farming is growing in prominence. Stock, especially cattle, are increasing in numbers. In 1913 the province possessed 35,952 horses, 48,565 milch cows, 64,261 other cattle, 85,660 sheep, and 43,762 swine. The total value of the live stock was $6,977,782, of which horses were valued at $4,272,536. The total trade of the island in 1913 was $1,548,761, of which imports were $975,683. The total revenue for 1913 was $511,000; total expenditure, $490,000. Prince Edward Island is extremely poor in minerals. Coal exists, but under conditions which have not made mining profitable. The neighboring waters abound in fish of many varieties, and the location of the island is most favorable for fishing, yet the people have not engaged so extensively in the industry as have the populations in the sister provinces. In 1913, however, the catch was valued at $1,379,905, with 5703 persons employed.

The fox-farming industry has been developed in Prince Edward Island to a remarkable extent. The breeding of seals, mink, skunk, and beaver has also begun. (See FUR FARMING.) Manufactures are not yet important and are principally for domestic wants. According to the Dominion Census of 1910 there were 442 industrial establishments, with a capital of $2,013,365, employing 3762 wage earners and with an output valued at $3,136,470. In 1913 there were 47 butter and cheese factories.

The Prince Edward Island Railway, which runs the length of the island, was built by the Dominion government, by whom it is still owned and operated. All parts of the island are traversed by coach roads. Regular water communication is maintained with the maritime provinces and with Boston. The question of continuous communication, winter and summer, with the other provinces of the Dominion and with the United States has been vital to the progress of the island as regards population, manufactures, and commerce, and in 1914 the Dominion government completed a government car-ferry service 10 miles long between Carleton Point, Prince Edward Island, and Cape Tormentine, New Brunswick.

The provincial government is vested in a Lieutenant Governor, an Executive Council of nine members appointed by the Lieutenant Governor, and a Legislative Assembly consisting of a single house whose 30 members are elected by the people. The province receives an annual subsidy from the Dominion, which constitutes about two-thirds of the total government revenue. In 1913 the amount was $372,000. The island is divided into three counties — Prince, Queens, and Kings—of which the chief towns are respectively Summerside, Charlottetown, and Souris. The island lacks a developed system of municipal government, and most of the local affairs are in the hands of the provincial Assembly.

The population decreased between 1901 and 1911 from 103,259 to 93,728. The density per square mile (42.91) is the highest for any Canadian province. Charlottetown, the capital, had a population of 11,198 in 1911. The religious denominations in 1911 were the Roman Catholic (41,994), Presbyterian (27,509), Methodist (12,209), Baptist (5372), and Anglican (4939). Anglican episcopal authority over the province is exercised by the Lord Bishop of Nova Scotia, and Roman Catholic by the Bishop of Charlottetown. The free school system was established in 1851, and the schools are supported by government grants and district assessments. The system is administered by a superintendent and council appointed by the government. In 1913 the total enrollment of pupils was 17,078, the average attendance 10,916, the number of teachers 590, and the expenditure $261,641, of which $165,155 was a government grant. There are two colleges, Prince of Wales College, head of the provincial school system, and St. Dunstan's, a Roman Catholic college, both in Charlottetown.

The island is supposed to have been seen by Cabot in 1497. From 1534 to 1798 it was known as Isle St. Jean. It came with Canada into English hands in 1763. The Legislature of Prince Edward Island at first declined to agree to plan for a union of the British North American colonies which resulted from the negotiations begun in 1864; but at last, in 1873, the colony entered the Confederation and became one of the provinces of the Dominion. Great discontent had resulted from the proprietorship of large landholders, but the grievances of the tenantry were remedied by the Prince Edward Island Commission (1875–76). The course of local politics followed the traditional Liberal and Conservative lines, but the main issues were the securing of better terms for the island as a member of the Confederation and the improvement of the means of communication with the mainland. Consult: D. Campbell, *History of Prince Edward Island* (Charlottetown, 1875); Sir J. W. Dawson, *Acadian Geology* (Ottawa, 1891); W. H. Crosskill, *Prince Edward Island: Its History, Interests, and Resources* (Charlottetown, 1899); *Canadian Annual Review* (Toronto, 1903 et seq.); C. D. McAlpine, *Gazetteer of Nova Scotia, New Brunswick, Prince Edward Island, and Newfoundland* (Halifax, 1911); Reports of Government Departments (Charlottetown, annually). See Canada.

PRINCE IGOR, ē′gôr. An opera by Borodin (q.v.), first produced in St. Petersburg (Petrograd), Nov. 4, 1890.

PRINCEITES. See Agapemone.

PRINCE OF WALES, Cape. See Cape Prince of Wales.

PRINCE OF WALES ISLAND. See Penang.

PRIN′CEPS, PRIN′CIPATE. See Emperor; Empire.

PRINCE RUPERT. A seaport and the capital of the Comox-Atlin electoral district, British Columbia, Canada, the Pacific Coast terminus of the Grand Trunk Pacific Railway, on the north end of Kaien Island, adjoining the Tsimpsean Peninsula, about 550 miles northwest of the city of Vancouver (Map: British Columbia, C 3). It has a mild climate the year round. Kaien Island is 7 miles long and has an area of nearly 12,000 acres. The harbor is capable of receiving the largest vessels. The city possesses a modern marine station and quarantine hospital, and its industrial establishments include cold-storage plants, saw mills, and a sash and door factory. It owns and operates its water, hydroelectric, and telephone plants. Pop., 1907, 600; 1911, 4184; 1915 (local est.), 6500.

PRINCE RUPERT'S DROPS. See Annealing.

PRINCE'S FEATHER. See Amaranth.

PRINCES ISLANDS. A group of small islands in the Sea of Marmora, 13 miles southeast of Constantinople, to which they are connected by ferries (Map: Balkan Peninsula, G 4). Prinkipo is the largest and most important of the group. There are several monasteries on the islands, a theological seminary of the Greek church, and a naval college. An earthquake in 1894 caused great destruction of life and property. The population is estimated at about 10,000, though but four of the islands are inhabited.

PRINCES OF THE TOWER. The name given to Edward V (q.v.) of England and his brother, Richard, Duke of York, the sons of Edward IV (q.v.). In May, 1483, Edward was seized by his uncle, Richard, Duke of Gloucester (see Richard III), and imprisoned in the Tower of London; in June his brother was sent to join him, while Gloucester was recognized by the Royal Council as Protector. At first it was rumored that the princes had been murdered, although later they were popularly supposed to have been exiled. After 20 years Sir James Tyrrell alleged that, on the refusal of Brackenbury, Constable of the Tower, to murder the princes at Richard's instigation, he himself with two servants had smothered them in their sleep. The testimony of Tyrrell, a notorious blackguard in the reign of Henry VII (q.v.), the enemy and successor of Richard, is by no means above suspicion. In the reign of Charles II two skeletons were found at the foot of a staircase of the White Tower and were buried in Westminster Abbey as the remains of the two princes. Consult James Gairdner, *Reign of Richard III* (London, 1879).

PRINCESS, The. A poem by Tennyson (1847). Mediæval in setting, but modern in thought, it is a kind of epic on the question of woman.

PRINCESSE D'AUBERGE, prăɴ′sĕs′ dō′bârzh′, La (Fr., The Princess of the Inn). An opera by Blockx (q.v.), first produced in Antwerp, Oct. 10, 1896; in the United States, March 10, 1909 (New York).

PRINCES STREET. A famous street in Edinburgh, Scotland.

PRINCETON, prĭns′ton. A city and the county seat of Bureau Co., Ill., 104 miles west by south of Chicago, on the Chicago, Burlington, and Quincy, and the Chicago, Ottawa, and Peoria railroads (Map: Illinois, F 3). It has the Matson Public Library and the library of the township high school, a picturesque park, and fine Federal, courthouse, and city-hall buildings. The surrounding district is fertile and is engaged in farming and cattle raising and coal mining. Princeton was settled in 1830, incorporated in 1838, and chartered as a city in 1884. It adopted the commission form of government in 1915. Pop., 1900, 4023; 1910, 4131.

PRINCETON. A city and the county seat of Gibson Co., Ind., 27 miles north of Evansville, on the Chicago and Eastern Illinois and the Southern railroads (Map: Indiana, B 8). Rich oil and gas fields were discovered in 1903. Among the industries are coal mining and the manufacturing of flour, carriages, and brick. Shops of the Southern Railroad also are here. The city contains a Carnegie library, a sanitarium, and a courthouse. Princeton was settled in 1814. Pop., 1900, 6041; 1910, 6448.

PRINCETON. A city and the county seat of Caldwell Co., Ky., 180 miles southwest of Louisville, on the Illinois Central Railroad, at the junction of the Nashville and Louisville branches (Map: Kentucky, C 5). It is a commercial centre of a tobacco-growing country and a point for rehandling and stemming tobacco. There are also a flour mill, brickyards, a creamery, an ice plant, a handle factory, and repair shops of the Illinois Central. Pop., 1900, 2556; 1910, 3015.

PRINCETON. A borough in Mercer Co., N. J., 10 miles north by east of Trenton, on the Pennsylvania Railroad and on the Delaware and Raritan Canal (Map: New Jersey, C 3). Princeton is a very picturesque town. It has an elevated site of great natural beauty, enhanced by wide avenues and fine shade trees. Its handsome residences, too, many of which are in the Colonial style, add to its attractiveness. Princeton University (q.v.) is the chief feature. Other educational institutions are the Princeton Theological Seminary (q.v.), the Rockefeller Institute for Medical Research, St. Joseph's College, and the Princeton Preparatory School. Pop., 1900, 3899; 1910, 5136; 1915 (State census), 5678.

Princeton was first settled about 1696 and received its present name in 1724. It was of little importance, however, until the removal here from Newark of the College of New Jersey in 1756. On Aug. 27, 1776, the first State Legislature of New Jersey assembled here and on August 31 chose William Livingston as Governor. Washington here surprised and defeated a body of British on Jan. 3, 1777. (See PRINCETON, BATTLE OF.) Congress, driven from Philadelphia by mutinous soldiers, met in Nassau Hall, Princeton, in June, 1783, and was in session until November 4. It was here that news reached it on October 31 of the final signing of the definite treaty of peace with England. Consult Hageman, *History of Princeton and its Institutions* (Philadelphia, 1870), and W. M. Sloane, "Princeton," in L. P. Powell (ed.), *Historic Towns of the Middle States* (New York, 1899).

PRINCETON. A city and the county seat of Mercer Co., W. Va., 72 miles southeast of Charleston, on the Virginian Railway (Map: West Virginia, C 4). Pop., 1910, 3027. Princeton was the scene of an engagement in the spring of 1862 between the Union forces under General Cox and the Confederate forces under General Marshall. Cox was obliged to retreat with a loss of about 115 men in killed, wounded, and missing. The losses on the Confederate side were much smaller.

PRINCETON, BATTLE OF. A battle of the American Revolution, fought Jan. 3, 1777, at Princeton, N. J., between an American force under General Washington and an inferior British force under Colonel Mawhood and General Leslie. On January 2 Cornwallis with about 8000 men took up a position on the west bank of the Assunpink at Trenton opposite the American army, which was inferior in every way to his own. Washington, unable on account of the floating ice to retreat across the Delaware, immediately resolved to attack the British detachments at Princeton and New Brunswick and, leaving his camp fires burning, marched around the British left during the night. Reaching the Stony Brook Bridge, about 2 miles from Princeton, at sunrise, he sent General Mercer with about 400 men to destroy the bridge on the main road to Princeton and went himself by a shorter way. The British force at Princeton, on its way to Trenton, encountered Mercer's brigade at the bridge. The Americans, occupying a piece of rising ground, began a vigorous fire upon the British, who soon made a bayonet charge and drove them from their position. During the fight General Mercer was mortally wounded, and his troops slowly retreated. The British pursued, but were soon stopped by a force of regulars and militia under Washington, who displayed the greatest personal gallantry. After a short but fierce engagement the British retreated rapidly, some towards Trenton and some towards New Brunswick, while Washington entered Princeton and seized the military stores left there by the enemy. On the approach of Cornwallis he withdrew and took up a strong position at Morristown. The British loss was more than 100 killed and wounded and about 230 prisoners. The American loss was about 100. Strategically the battle was very important, as it forced Cornwallis to fall back to New York and left New Jersey in the possession of the Americans, besides inspiring the hitherto discouraged people to renewed efforts against the enemy. Consult: W. S. Stryker, *Battles of Trenton and Princeton* (Boston, 1898); V. L. Collins (ed.), *Brief Narrative of the Ravages of the British and Hessians at Princeton in 1776–77* (Princeton, 1906); A. A. Woodhull, *Battle of Princeton* (ib., 1913).

PRINCETON THEOLOGICAL SEMINARY. The oldest Presbyterian school of theology in the United States. The movement which led to its foundation took definite form in 1809; a "Plan for a Theological Seminary" was adopted by the General Assembly of the Presbyterian church in 1811, and the seminary was established at Princeton in 1812 and duly began its work on August 12 of that year with three students in attendance, to whom 11 were added in the course of the session. Rev. Archibald Alexander, its first professor, was appointed to the chair of didactic and polemic divinity in 1812. During the 103 years of its existence up to 1915, the seminary has matriculated about 6150 students. Its teaching force consists of a president and 11 active professors, with two additional instructors. It possesses grounds and buildings valued at $664,000 and invested funds aggregating about $3,200,000, with a gross income of about $144,000. Its library contained, in 1915, 100,253 volumes and 33,123 pamphlets. The attendance of students for the session of 1914–15 was 177, including 6 fellows and 33 graduate students. The curriculum of the seminary includes the whole circle of the recognized theological discipline. The degree of bachelor of divinity is conferred for advanced work under certain stringent conditions which give it especial value. Six fellowships supporting graduate students for an additional year of research work are granted annually. The teaching in the seminary is regulated by a special subscription required of all the professors to the Confession of Faith of the Presbyterian Church in the United States of America. The type of teaching prevalent at Princeton began in 1831 or 1832 to be called "Princeton theology." The seminary maintains a quarterly journal, published under the name of the *Princeton Theological Review.* The president in 1915 was Rev. J. Ross Stevenson, LL.D.

PRINCETON UNIVERSITY. An institution for higher education at Princeton, N. J., founded in 1746. About 1726 William Tennent, a graduate of the University of Edinburgh, had established in Bucks Co., Pa., a school known as the Log College, the success of which led in 1739 to a movement by the Synod of Philadelphia towards the establishment of a larger college for the Middle Colonies. The plan was abandoned owing to the unsettled condition of the times. In 1742 internal conflicts led to the division of the synod, and members of the newly formed Synod of New York determined on independent action. They sought a charter for the founding of a college in New Jersey, without assistance from either of the old synods, and secured it on Oct. 22, 1746, from John Hamilton, acting Governor of New Jersey. The institution was called the College of New Jersey and was situated at Elizabethtown. The first president was Rev. Jonathan Dickinson. A second charter was granted in 1748 by Jonathan Belcher, royal Governor of New Jersey, owing to doubts as to the validity of the first charter, and in order to give other religious communions a share in the administration of the institution. President Dickinson died in 1747 and was succeeded by Rev. Aaron Burr, to whom belongs the credit for the organization of the curriculum, the procedure, and the discipline of the college. The institution was soon removed to Newark, where the first commencement was celebrated in 1748. In 1752 it was voted that the college be fixed at

Princeton on condition that the inhabitants secure to the trustees 10 acres of cleared land, 200 acres of woodland, and the sum of £1000. In 1754 the corner stone was laid for the first building, which was named Nassau Hall. The college was completed and the students removed from Newark to Princeton in the fall of 1756. President Burr died in 1757 and was succeeded by Rev. Jonathan Edwards, who died a month after assuming office. He was followed by Rev. Samuel Davies, who devoted much time to building up a college library. Davies was succeeded by Rev. Samuel Finley (1761–66) and in 1768 John Witherspoon, D.D., a Scottish clergyman, was inaugurated as president. He was a bold and active advocate of American independence. Among the students of this period were many later conspicuous as leading spirits, among them James Madison, Aaron Burr (son of the early president), William Bradford, Philip Freneau, and Henry Lee. The college suffered heavily during the war. The course of instruction was interrupted by the presence of both armies; Nassau Hall was wrecked, the library scattered, and the philosophical apparatus ruined. Yet only one commencement, that of 1777, was omitted, and the seven members of the graduating class for that year received their degrees a few months after the regular time.

President Witherspoon was succeeded in 1795 by Samuel Stanhope Smith, under whose administration the curriculum was broadened and the first provision was made for regular instruction in chemistry in an American college. On March 6, 1802, the interior of Nassau Hall was destroyed by fire, but was rebuilt in 1804. During the administrations of Presidents Ashbel Green (1812–22) and James Carnahan (1823–54) the institution had a rapid development. A department of law was established in 1846, but was abandoned in 1852 from lack of funds. Under President John Maclean (1854–68) four new professorships were established, with an endowment of $195,000. On March 10, 1855, the interior of Nassau Hall was again burned and was rebuilt in 1860. James McCosh of Queen's College, Belfast, was elected president in 1868 and resigned the office in 1888. During his term the attendance increased from 281 to 603, and the faculty from 10 professors and 7 tutors to 31 professors, 4 assistant professors, and 5 instructors. Gifts amounting to upward of $3,000,000 were received, of which $1,000,000 was expended in the erection of 14 buildings. Among the more important changes in the curriculum were the introduction of the system of elective studies (1870), the founding of the John C. Green School of Science (1873), and the establishment of the Graduate Department (1877). Francis Landey Patton (q.v.) was president from 1888 to 1902. During the 14 years of his administration the college increased from 603 to 1354 students, and the faculty from 40 to 100 instructors, while 17 new buildings were added to the equipment. On Oct. 22, 1896, the corporate title was changed to Princeton University.

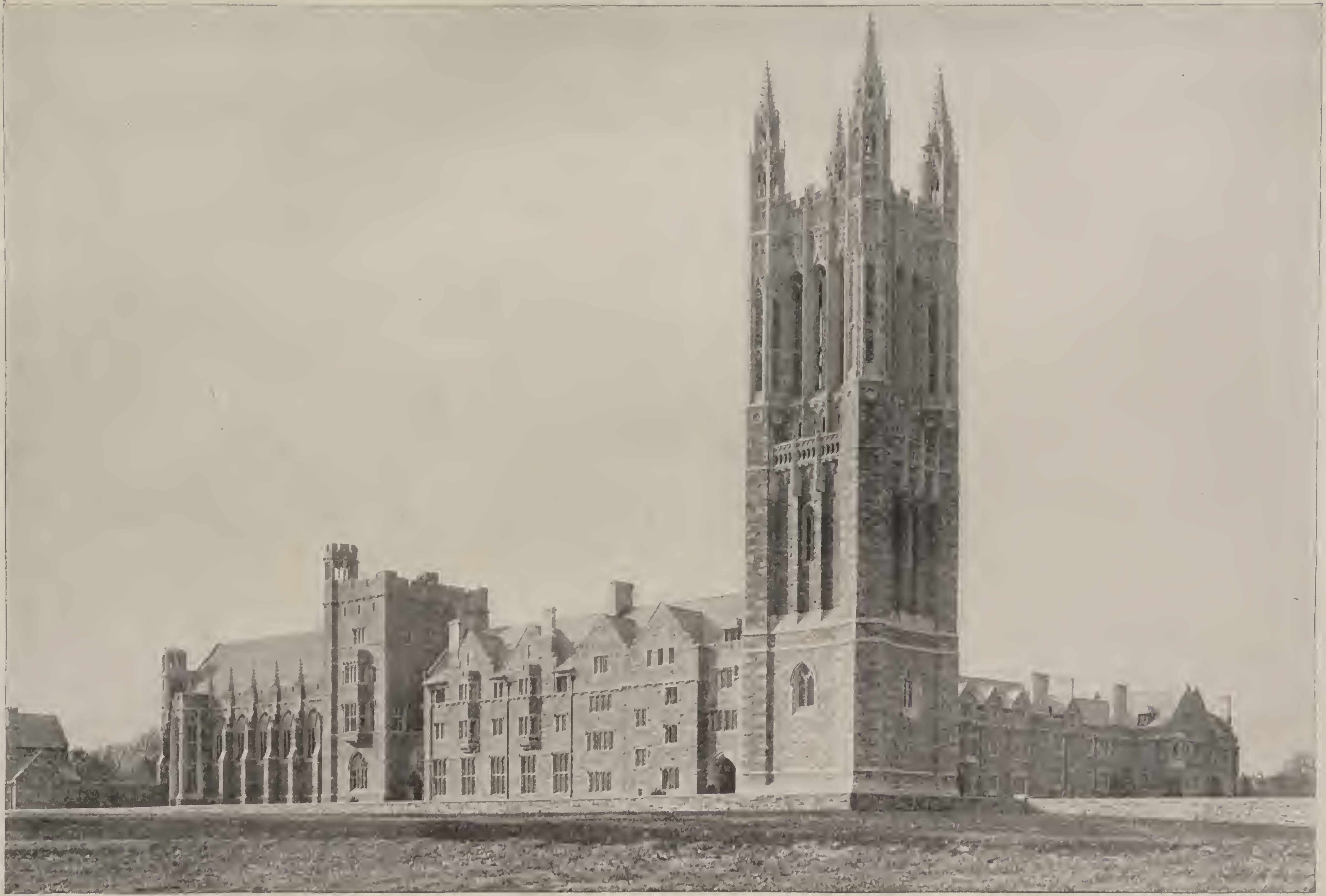
Dr. Patton resigned the presidency in June, 1902, but retained his professorship in the university and was president of the Princeton Theological Seminary until 1913. He was succeeded in the presidency of the university by Woodrow Wilson, the first lay president, who held the office until Oct. 20, 1910, when he resigned to accept the Democratic nomination for Governor of New Jersey.

During President Wilson's administration the undergraduate course of study was thoroughly revised and coördinated; the preceptorial system of instruction was introduced, thereby adding to the faculty about 50 preceptors with the rank of assistant professor; the faculty was further strengthened by the addition of a considerable number of professors distinguished in their several departments of study, notably in classics, mathematics, physics, and biology; the facilities of the university for both classroom and laboratory work were greatly increased by the building and equipment of a handsome recitation and lecture hall and of large and complete laboratories for physics, biology, and geology; three new dormitories were erected; and large endowments were received for the development of the Graduate School.

From October, 1910, to January, 1912, John Aikman Stewart, senior trustee, acted as president pro tempore, by resolution of the board of trustees. John Grier Hibben (q.v.) was elected president on Jan. 11, 1912. Since his inauguration the Graduate College of Residence has been completed and put into successful operation, the course of civil engineering has been reorganized and strengthened, and the university has maintained a steady growth both in endowment and material equipment and in the number of students, particularly in the Graduate School. The government of the university is in the hands of a self-perpetuating board of trustees under the presidency (ex officio) of the Governor of New Jersey. In 1900 five alumni trustees were added to the board, holding office for five years. The requirements for admission to the college, since June, 1903, conform to the recommendations of the National Education Association and the College Entrance Examination Board, which conducts the entrance examinations. The university is organized in three departments, the Academic, the School of Science, and the Graduate School, together with the technical departments of Civil and Electrical Engineering. The undergraduate curriculum offers instruction in the following divisions: (1) philosophy, (2) art and archæology, (3) language and literature, (4) mathematics and science. Candidates for the bachelor's degree enter either the Academic Department or the School of Science. The Academic curriculum leads to the degrees of bachelor of arts (A.B.) and bachelor of letters (Litt.B.), while the curriculum of the School of Science leads to the degrees of bachelor of science (B.S.) and civil engineer (C.E.). Candidates for the A.B. degree offer Greek at entrance and fulfill the full classical requirements during their freshman and sophomore years, after which they are free to choose their studies, but must elect about half of their courses in some one department. The degree of Litt.B. is conferred on those who, having substituted for Greek at entrance either two modern languages or one modern language and a science, concentrate during the junior and senior years in one of the philosophical, literary, political, or other humanistic departments. The degree of B.S. is conferred on those who enter with a similar substitution for Greek, but who concentrate during the two upper years in one of the mathematical or scientific departments. The degrees of C.E. and E.E. are conferred on completion of the requirements of the departments of Civil Engineering and Electrical Engineering respectively.

The Graduate School offers more than 200

PRINCETON UNIVERSITY



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THE GRADUATE COLLEGE AND CLEVELAND MEMORIAL TOWER

courses of study leading to the master's and doctor's degree in arts and science. About 40 fellowships, ranging in value from $600 to $1000, are offered for advanced work. The distinguishing feature of the Graduate School is the Graduate College of Residence, where graduate students may have the full advantage of a common life in scholarly surroundings at a minimum cost. The Graduate College has dormitory accommodations for more than 100 men, and the graduate students rooming elsewhere may board at the college.

The University Campus consists of 632 acres. Nassau Hall (1756) contains the administrative offices of the university, the Laboratory of Experimental Psychology, and the Faculty or "Congress" room. The dormitories include West College (1836), Reunion Hall (1870, named to commemorate the reunion of the Old and New schools of the Presbyterian church), Witherspoon Hall (1877), Edwards Hall (1880), Albert B. Dod Hall (1890), David Brown Hall (1891), Upper and Lower Pyne buildings (1896), Blair Hall (1897), Stafford Little Hall (1899, which is joined by an extension erected in 1902), Seventy-nine Hall (1904), Patton Hall (1906), Campbell Hall (1909), Holder Hall (1910), Hamilton Hall (1911), and Cuyler Hall (1912). The Library in 1915 contained 320,701 volumes and 80,000 unbound periodicals and manuscripts. The Literary Society libraries and the library of Princeton Theological Seminary raise the number of volumes to a total exceeding 430,000. Other important university buildings are the Isabella McCosh Infirmary (1892 and 1899), Dickinson Hall (1870), Marquand Chapel (1881), Alexander Hall (1892), McCosh Recitation Hall (1906), the Gymnasium (1903), the Graduate College and the Cleveland Memorial Tower (1912), the Palmer Memorial Stadium (1914), and the University Dining Halls (which were being constructed in 1915). In 1906 an artificial lake, formed by flooding lowlands near the Campus, was presented to the university by Andrew Carnegie.

The museums comprise the Natural Science Museum, established in Guyot Hall, and the Museum of Historic Art, in the Art Building. The laboratories include the Halsted Observatory and the Observatory of Instruction, the Psychological Laboratory, the Palmer Physical Laboratory (for the departments of Physics and Electrical Engineering), the Chemical laboratories, the laboratories of the departments of Biology and Geology in Guyot Hall, the Vivarium, and the Civil Engineering Laboratory.

In 1915 the total students' attendance was 1643, and the faculty numbered 207; trustees and officers, 48. The endowment is about $5,400,000 and the annual income about $660,000 exclusive of gifts for current and special expenses. Consult: J. R. Williams, *Handbook of Princeton* (New York, 1905); E. E. Slosson, in *Great American Universities* (ib., 1910); V. L. Collins, *Princeton* (ib., 1914).

PRINCE WILLIAM SOUND. The largest and most important extension of the Gulf of Alaska. It lies principally between long. 145° and 148° W. and lat. 60° to 61° N. Shut in by the Chugach Mountains to the east and by the Kenai to the west, these ranges are intersected by numerous bays and by glacial fiords from 12 to 30 miles in length. The Sound has the most northerly ice-free harbors of America, especially important, as for 175 continuous miles this coast has no practicable harbors. Since 1900 this region has developed rapidly through mining and railroad construction. On its eastern shores are large copper deposits in the Ellemar and Port Fidalgo region, as well as on Knight and Latouche islands. In the fiords are the most numerous and active glaciers of Alaska. The Columbia Glacier, descending between cliffs 2500 to 3000 feet high, presents in Columbia Bay a face about 4 miles broad and from 100 to 250 feet high. Cordova, on Orca Sound, is a railway town of importance, whose imports amount to nearly $1,000,000 annually. It is the coast terminus of the Copper River and Northwestern Railroad, a standard line of 198 miles, which reaches the Bonanza copper mine in the Nizina valley. The population of Cordova in 1915 was about 1000. Consult A. W. Greely, *Hand-Book of Alaska* (New York, 1914), and Tarr and Martin, "Alaskan Glacier Studies," in *National Geographic Society, Bulletin* (Washington, 1914).

PRINCIPAL (Lat. *principalis*, chief, from *princeps*, first, chief, prince). A legal term having several distinct applications. In criminal law all actually participating in the commission of a crime or who are present aiding and abetting in its commission are principals, while those who aid or abet before or after its commission are termed accessories. Actual physical presence is not necessary to constitute one a principal. One may be a principal who is only constructively present at the commission of the crime by aiding in its commission at the time. See ACCESSORY.

In the law of agency one who appoints an agent is called a principal. (See AGENT; MASTER AND SERVANT.) In the law of suretyship the principal debtor for whom another becomes surety is known as a principal. See FRAUDS, STATUTE OF; SURETYSHIP.

PRINCIPAL AND AGENT. The parties to the relation commonly known as an agency, the principal being the employing party, the agent the party employed. The law of the subject is usually, in legal literature, comprehended under this title. In this work it will be found under the title AGENT. See also CONTRACT; PRINCIPAL.

PRINCIPAL AND SURETY. A phrase descriptive of two persons who are indebted to a third, but whose relations are such as to make it the duty of the one, who is the principal debtor, to discharge the debt and save the other, who is his surety, harmless therefrom. See GUARANTY; SURETYSHIP; and the authorities there cited.

PRÍNCIPE, prē̇n′thē̇-pȧ. A district on the east coast of Luzon, Philippine Islands, belonging to the Province of Tayabas (q.v.).

PRINCIPE, prē̇n′chē̇-p*e*, IL (It., the Prince). A celebrated short political treatise by Niccolò Machiavelli (1513) showing how a ruler might gain and extend absolute power. Cesare Borgia was presumably the model for the prince, and the dissimulation and treachery advocated to attain success made Machiavelli's principles synonymous with political infamy. A modern view has credited him with an ardent longing for Italian unity and with the purpose of portraying merely the methods of his own time.

PRINCIP′IA (Lat., principles). A famous mathematical treatise in Latin by Sir Isaac Newton (1687). It contains the full development of Newton's great discovery, the principle of universal gravitation.

PRIN'DLE, CYRUS (1800–77). An American Abolitionist and one of the founders of the Wesleyan church of America. He was born in Vermont and entered the New York conference in 1821. An Abolitionist in principle, he was removed from important appointments to the poorest, and in 1843 with others he seceded from the Methodist Episcopal church and founded the Wesleyan church. When the movement had accomplished its purpose, with about 100 others of his ministerial associates, he returned to the Methodist church.

PRINGLE, prĭṉ'g'l, SIR JOHN (1707–82). An English physician, born at Stitchel, Roxburghshire and educated at St. Andrews, at Edinburgh, at Leyden, and in Paris. In 1734 he was appointed professor of metaphysics and moral philosophy in Edinburgh University. He settled in London in 1748, where he became physician to the Queen in 1761 and to the King in 1774. Sir John may be called the founder of modern military surgery. To him we owe the first proposal that military hospitals should be regarded as neutral and immune from attack. His most important work was done as an army sanitarian in Flanders, Germany, and Scotland. In this field his *Observations on the Diseases of the Army* (1752) is regarded as a classic. He made special observations of typhus. His life by Kippis is prefixed to *Six Discourses Delivered at the Royal Society* (London, 1783).

PRINGLE-PAT'TISON, ANDREW SETH (1856–). A British philosopher. He was born at Edinburgh and was educated at the university there and in Germany. He returned to Edinburgh to be an assistant and lecturer for three years, in 1883 went to University College, Cardiff, to be professor of logic and philosophy, and in 1887 accepted a similar chair at St. Andrews. From 1891 he served as professor of logic and metaphysics at Edinburgh. In 1911–13 he delivered the Gifford lectures at Aberdeen. In 1898 he assumed the name Pringle-Pattison on succeeding to the Haining estate, but he is sometimes referred to as Andrew Seth. His publications include: *The Development from Kant to Hegel* (1882); *Essays in Philosophical Criticism* (1883), edited in conjunction with R. B. Haldane; *Scottish Philosophy* (1885; 3d ed., 1899); *Hegelianism and Personality* (1887); *Man's Place in the Cosmos* (1897); *Two Lectures on Theism* (1897; enlarged ed., 1902); *The Philosophical Radicals* (1907).

PRINGSHEIM, prĭṉks'hīm, ALFRED (1850–). A German mathematician, born at Ohlau in Silesia. Educated at the universities of Berlin and Heidelberg, he became docent in 1877 and professor in 1882 at Munich. He wrote many important papers in mathematical periodicals, especially on infinitesimal calculus, and published in 1896 a German version with commentary of Daniel Bernoulli's Latin treatise on probabilities.

PRINGSHEIM, ERNST (1859–). A German physicist, a kinsman of Nathanael Pringsheim. He was born at Breslau and studied at the university there, at Heidelberg, and at Berlin, where he became docent in 1886 and professor in 1896. In 1905 he accepted a chair of theoretical physics at Berlin. His more famous experiments were on radiation and on the relation between full radiation and temperature, on measuring the ratio of the specific heats of gases, and experiments on which he based the theory (later modified) that reduction of metallic oxide accompanied the emission of line spectra of alkali metals. The variety of his activities may be suggested by his collaboration with Schwan in a study on the nature of French accent and by his work with Gradenwitz to secure photographic reconstructions of palimpsest manuscripts. He wrote *Vorlesungen über die Physik der Sonne* (1910).

PRINGSHEIM, NATHANAEL (1823–94). A German botanist, born at Wziesko, near Landsberg, Silesia. For a time he studied medicine, associated himself with the Liberal political movement, and then turned definitely to natural science. In 1851 he became a lecturer at the University of Berlin. As a result of his essays *Grundlinien einer Theorie der Pflanzenzelle* (1854) and *Ueber die Befruchtung und Keimung der Algen und das Wesen des Zeugungsaktes* (1855–57) he was chosen in 1858 a member of the Royal Academy of Scientists. In 1857 he founded the *Jahrbuch für wissenschaftliche Botanik,* which he edited up to the time of his death. He was professor of botany at Jena from 1864 to 1868, and then returned to Berlin, devoting himself almost entirely to research. In 1882 he founded and became the first president of the German Botanical Society. He was one of the foremost cryptogamic botanists of the nineteenth century. Among his works, which were published in four volumes at Jena in 1895–96, are the following: *Beiträge zur Morphologie der Meeresalgen* (1862); *Ueber die Embryobildung der Gefässkryptogamen und das Wachstum von Salvinia natans* (1863); *Ueber Paarung von Schwärmsporen* (1869); *Weitere Nachträge zur Morphologie und Systematik der Saprolegniazeen* (1873); *Untersuchungen über das Chlorophyll* (1874).

PRIN'SEP, JAMES (1799–1840). An English architect and Orientalist, who studied under Pugin, the celebrated architect. Owing to impaired eyesight he gave up his studies for a time and went out to India (1819), where he became in turn assistant assay master in the Calcutta mint, assay master in the Benares mint, and eventually assay master in the Calcutta mint (1832). At Benares he designed the mint, built a bridge over the Karamasa, and took down and restored the minarets of the Mosque of Aurungzebe. At Calcutta he constructed a canal between the Hugli and the Sundarbans. In numismatics he won distinction by "Useful Tables Illustrative of Indian History," included in his collected works (London, 1858). At Calcutta he edited *Gleanings in Science,* afterward the journal of the Asiatic Society, of which he became secretary. He also succeeded in deciphering inscriptions that hitherto had baffled scholars. Weakened in health, he returned in 1838 to England, where he died. Consult *Essays on Indian Antiquities* . . . with memoir by Henry Thoby Prinsep, edited by Thomas (London, 1858).

PRINSEP, VALENTINE CAMERON (1838–1904). An English figure, historical, and portrait painter, also an author. He was born in Calcutta, India, was a pupil of Watts in London, and of Gleyre in Paris, and was later influenced by Rossetti. A follower of the classical school, his favorite subjects were pseudo-Oriental girls, beautiful, but without temperament, such as

"Ayesha," in the Tate Gallery. He went to India to paint the "Declaration of Queen Victoria as Empress" in 1876, a large canvas with many portraits, now in St. James's Palace. He was elected to the Royal Academy in 1894. His publications include *Imperial India: An Artist's Journal* (1879), several novels and plays, and some writings on art.

PRIN'STERER, GUILLAUME GROEN VAN. See GROEN VAN PRINSTERER.

PRINT (by aphæresis, from ME. *emprinten, enprinten*, to imprint, from OF., Fr. *empreinte*, imprint, p.p. of *empreindre*, It. *imprimere*, to impress, imprint, from Lat. *imprimere, inprimere*, to impress, from *in*, in + *premere*, to press). In the fine arts, an impression from an engraved metal plate, wood block, or lithographic stone, of a design or picture, in ink or color, upon paper or other suitable material. The custom of calling such impressions engravings is erroneous, and the term "print" is the one which should be used in such cases. The art of printing from an engraved plate is not wholly mechanical, because there are many cases in which the impression taken is not merely a flat transfer from the unmodified, hard surface. Thus, in printing woodcuts, it is customary to use what are called overlays, which are pieces of thin paper cut in peculiar shapes, accommodated to the design engraved upon the block; and these overlays are placed where needed behind the paper upon which the transfer is to be made in such a fashion as to cause certain parts of the printing to be stronger and blacker than others. So in the printing from dry point (q.v.) plates in which that process has been used for the completion of an etching (q.v.) it is quite usual to leave a certain amount of ink upon the surface of the copper plate, thus completing the line work of the draftsman by the surface work or gradation made by the printer. The word "print" is also used as meaning one of the more ordinary impressions from the block or plate in contradistinction to the proofs of different kinds. Consult: Frank Weitenkampf, *How to Appreciate Prints* (New York, 1908); Fitz Roy Carrington, *Prints and their Makers* (ib., 1912); E. H. Richter, *Prints: A Brief Review of their Technique and History* (Boston, 1915); and the bibliography of ENGRAVING. See AQUATINT; DRY POINT; ETCHING; LINE ENGRAVING; MEZZOTINT; PROOF; WOOD ENGRAVING.

PRINTERS BIBLE. See BIBLE, CURIOUS EDITIONS OF.

PRINTING. The process of taking impressions, generally on paper in ink, of printing types or of designs, drawings, or photographic prints, which have been previously cut, etched, drawn, or engraved on some solid surface. Printing with ink is done by three methods: (1) from a raised surface in high relief, as in type or woodcuts; (2) from a sunk or incised surface, as in copperplate engraving; (3) from a flat surface on stone made repellent to ink in portions by dampening the stone, as in lithography (q.v.). As the raised surface is most easily inked and impressed, typography is found most generally useful.

The Chinese methods of printing were practiced at a very ancient date. As early as 50 B.C. the Chinese had originated a method of printing in ink on paper by means of engraved blocks, although it was not until nearly 1000 years later that printing in this manner was extensively practiced. In 925 A.D. the principal Chinese classics were printed for the Imperial College of Peking from blocks of wood engraved in relief. By this process a separate engraved block had to be prepared for each printed sheet or page. The Chinese are also credited with having used movable type as early as the twelfth and thirteenth centuries, and such types are now used extensively by the European missions in China for printing Chinese books and papers. The chief difficulty in using movable types for printing Chinese is due to the fact that each Chinese word requires a separate character instead, as in the European languages, of being composed of letters or characters which are resolvable into an alphabet. Movable copper types are said to have been used also by the Koreans as early as the first part of the fifteenth century.

In Europe in classical and mediæval times books were made by transcribing them in manuscript (q.v.). About the thirteenth century, in Italy and Spain, these manuscripts began to be produced with the initial letters stamped in ink from engraved blocks of wood. This practice was gradually developed until printing blocks were quite commonly employed in printing images and text, generally of a religious character, on paper sheets which were bound together in book form. In short, the gradual development of printing in relief was as follows: (1) initial letters, autographs, and trademarks; (2) playing cards; (3) figured or ornamental textile fabrics; (4) religious pictures with and without lettering; (5) engraved words without pictures; (6) types of single letters founded in a mold.

The question as to the inventor of typography, i.e., the one who was really the first to employ movable printing types, has been a subject for discussion for several hundred years. This dispute, which has been rather national in character, has now narrowed itself down to the two names of Laurens Janszoon Coster (q.v.), of Haarlem, Holland, and John Gutenberg (q.v.), of Mainz, Germany. Coster is said to have invented types of wood about 1420 and movable types of metal, with which he printed several small books, between 1440 and 1446. It is also claimed that his types were stolen by one of his workmen and carried to Mainz, where this workman introduced typography. The facts in Gutenberg's career as a printer are meagre. There is an unsatisfactory record that he experimented with printing at Strassburg in 1439. In 1448 he had a printing office at Mainz; in 1455 he was sued by John Fust (q.v.), who was associated with him in the enterprise, for the recovery of money lent, and judgment being secured against him, Fust seized his printing-house equipment. Another printing establishment was started by Gutenberg, who operated it until his death, about 1468. Meanwhile Fust, in partnership with Peter Schöffer, is said to have continued the operation of the printing establishment founded by Gutenberg. Upon the sacking of Mainz in 1462 and the suspension of printing for three years, the pupils and workmen of these printers were scattered and the art, which had been carefully guarded as a secret, became widely known. Printing was practiced in Rome in 1467, in Paris in 1470, in Spain in 1474, and in England in 1477, the first press in this last country being set up at Westminster Abbey by

William Caxton (q.v.). The first press in the New World was established at the city of Mexico in 1544, and this was followed by one in Peru at Lima in 1585. The first press in the British colonies of North America was set up at Harvard College in 1639, and this press still continues under the name of The University Press.

In a brief review of the development of printing it is impossible more than to allude to the work of such famous printers as Aldus Manutius (q.v.), who, with other members of the same family, published the famous Aldine editions (q.v.), the Elzevirs (q.v.), whose activities extended from 1583 to 1712, and the Stephens of Paris, famous for their editions of the Scriptures and the classics.

Modern Printing Types. Types of metal are manufactured by a process of founding, using an alloy made chiefly of lead, with smaller amounts of tin and antimony. (See TYPE FOUNDING.) The earliest types used were of the style known as Gothic or black letter, which was afterward superseded, except in Germany, Russia, and Greece, by the Roman letter. (See BLACK LETTER.) Printers formerly had a distinct name for each size of type, and used about 16 sizes in different descriptions of bookwork; by the older terminology the smallest was called *excelsior,* the next *brilliant,* and then follow in gradation upward, *diamond, pearl, agate, nonpareil, minion, brevier, bourgeois, long primer, small pica, pica, English, great primer,* and *double pica.* The larger sizes generally took their names thus: *two-line pica, two-line English, four, six, eight,* or *ten line pica,* etc. Some of these names were given from the first maker; others from the books first printed with the particular letter. Thus, in France and Germany *Cicero* was the name of a type with which Cicero's letters were first printed (Rome, 1467); *pica* is from the ritual book, termed *pica* or *pic; primer,* from *Primarius,* the book of prayers to the Virgin; *brevier,* from *breviary; canon,* from the *canons* of the Church; etc. The following illustrates the size of the various types:

1—Brilliant,	International.
2—Diamond,	International.
3—Pearl,	International.
4—Agate,	International.
5—Nonpareil,	International.
6—Minion,	International.
7—Brevier,	International.
8—Bourgeois,	International.
9—Long Primer,	International.
10—Small Pica,	International.
11—Pica,	International.
12—English,	International.
13—Great Primer,	International.

At present in Europe and America, generally, printers use a numerical nomenclature instead of the old nomenclature given above and commonly used by the layman. This nomenclature, as adopted by the United States Typefounders' Association in 1886, is as shown in the following table, a point being equivalent to 0.0138 inch.

A complete and proportioned assortment of all the letters and signs of any one particular body and face of type is called a font, which may be regulated to any extent. American founders assort characters by weight and not by count. As types of the same body vary in width (some thin and some wide), a specification by count of single types would be misleading as to weight. The following table shows the relative frequency of the letters in composition:

OLD NAME	Square of "body" in inches	New name
		Point
Excelsior	0.0415	3
	0.0484	3½
Brilliant	0.0553	4
Diamond	0.0622	4½
Pearl	0.0692	5
Agate	0.0761	5½
Nonpareil	0.0830	6
Minion	0.0968	7
Brevier	0.1107	8
Bourgeois	0.1245	9
Long Primer	0.1383	10
Small Pica	0.1522	11
Pica	0.1660	12

e	1,000	m	272
t	770	f	236
a	728	w	190
i	704	y	184
s	680	p	168
o	672	g	168
n	670	b	158
h	540	v	120
r	528	k	88
d	392	j	55
l	360	q	50
u	296	x	46
c	280	z	22

The types used in printing offices are sorted in different boxes of two shallow trays known as upper and lower case, the latter lying nearest the compositor upon the frame for their support. The lower case is placed immediately under his hand, the upper case directly above in a slanting position, and the under part of the frame is stocked with cases of different fonts. In the upper case are placed all the capitals, small capitals, and a few of the characters used as references to notes. In the lower case are all the small letters, figures, most of the points, and the spaces for blanks between the words. In the lower case alphabetical arrangement is not preserved; each letter has a larger or a smaller box allotted to it, according as it is more or less frequently required; the letters in most request are placed at the nearest convenient distance to the compositor. See article CASE for illustration.

Type-Setting or Composing. The setting of printing types in proper order for printing is termed composing, and may be performed either by hand or by machine. In hand composition the compositor places the copy before him on the upper case, and standing in front holds in his left hand a short tray of iron or steel, known as a composing stick. The stick has a movable slide, which may be regulated to any width of line. One by one the compositor picks up and puts together the letters of each word and sentence, and the appropriate points, into his stick, securing each with the thumb of his left hand, and placing them side by side from left to right along the line. When he arrives at the end of his line the compositor must *justify,* or separate, the words so that they will fill the width of the measure. Spaces of varying thickness are inserted as evenly as possible between the words. When the compositor has set up as many lines as his composing stick will hold conveniently, they are lifted by grasping them with the fingers of each hand as if they were a solid piece of metal. He then places the mass upon a shallow tray termed a galley, which has a ledge on two or three sides.

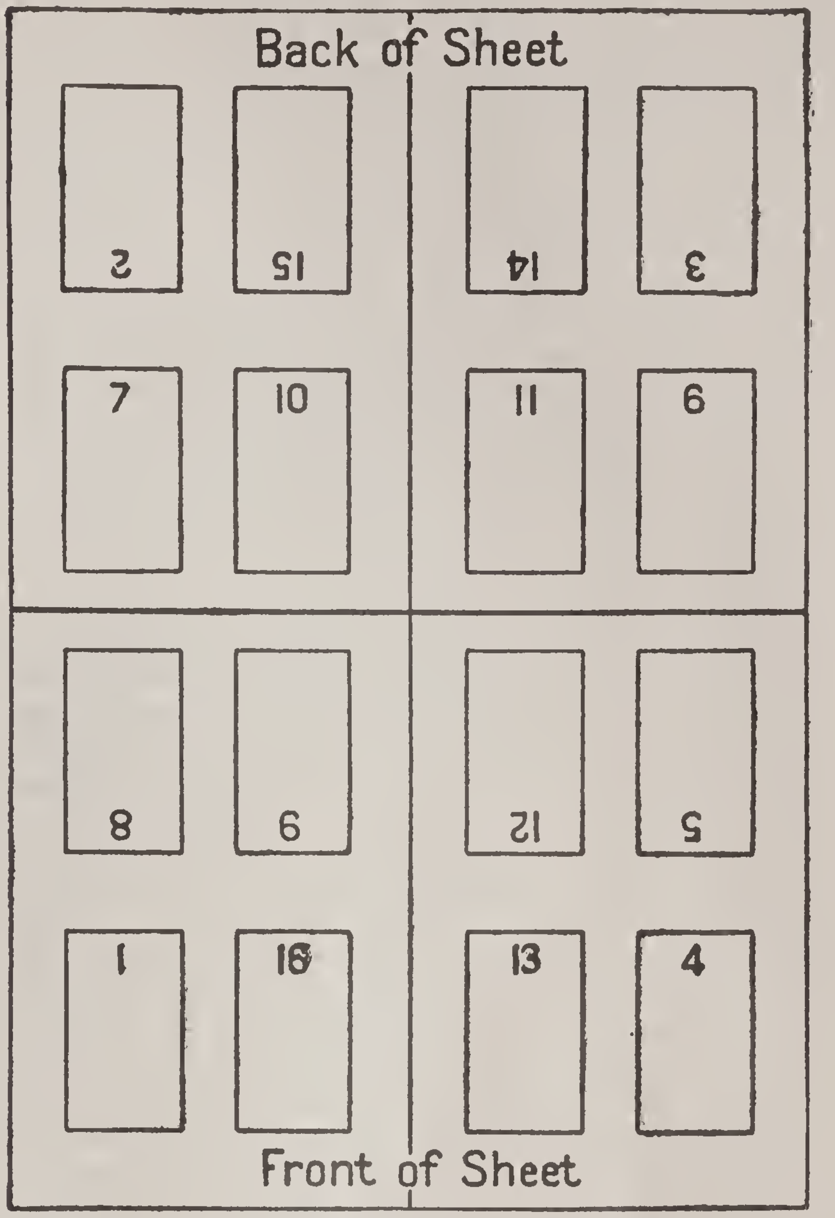
On account of the improvements and the adaptability of typesetting machines, such as the linotype and the monotype, a very large part of the composition of books, magazines, and newspapers is now produced by these machines instead of by hand. See TYPESETTING MACHINES.

The printer's unit of measurement by which the compositor is paid is the em in America and the en in Great Britain. An em is the square of the body of the type selected; the number of ems that fill a line multiplied by the number of ems in the height of a page gives the total number of ems of type in the page. One thousand ens English equal 500 ems American. The piece compositor is paid an agreed rate per 1000 ems, but the rate varies with different kinds of composition. Tabular matter, mathematical formulas, etc., are usually paid for on a time basis.

Composed type that has served the purpose for which it was set is known as dead matter, and its separate letters have to be distributed into the case for re-use, in new work. The compositor first wets the composition so that the separate types will slightly cling together. He then places a number of lines upon his composing rule, picks up a few types between thumb and forefinger, and drops them one at a time into their proper compartments in the case.

Make-Up is done by taking composed type from the galley in sufficient quantity to make a page of the prescribed size after adding the running titles and the folios, or page numbers. It is then tied up so that it can be safely handled and is put upon an imposing stone or iron-topped table. When the page consists of several columns, as in newspapers, the type of one column is placed after another upon the stone. The pages are separated by suitable blanks, and the whole mass of type is locked up by filling the angular space around the type and inside the iron frame, or chase, with strips of wood or metal, called furniture, and by wedging them with screw clamps, or quoins, so tightly that none of the type can fall out. Proofs are taken from the type in galley and in page form, which are read for errors, so that corrections may be made before the type is sent to press. At least two proofs of the type—a galley proof and a page proof—are always taken and read for errors, and very often in careful work several proofs of each kind are pulled and read by different persons. See PROOF READING.

The printer's form may consist of any number of pages from 2 to 128. Imposition is a method of arranging pages so that they will follow one another upon the printed paper in the proper consecutive order. The method of imposition, or the order of arrangement, differs according to the number of pages in the form, but the general principle of the process may be understood from the following diagram of a 16-page form, in which the numeral in each case indicates the number of the page in that form and its location the top of the page. To guide the binder in arranging the printed sheets in their proper order, letters or numerals known as signature marks are placed at the foot of the first page of each section. The letters J, V, and W, are not used for this purpose.

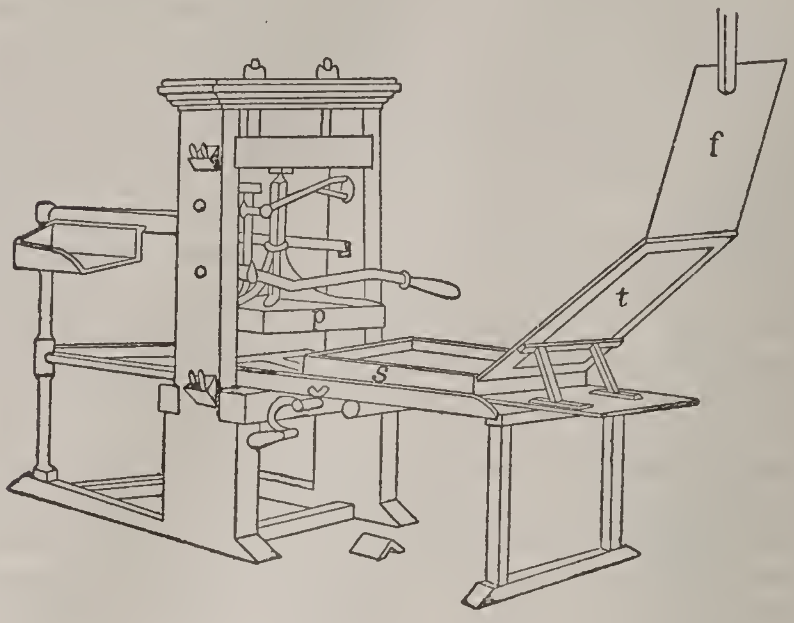


Stereotyping is a process by which the composed types of a page are cast in one piece. The object is to make resetting unnecessary for subsequent editions and save wear of type. Many methods have been invented, but only two are now in use—stereotyping by the papier-maché process and electrotyping. The papier-maché process is preferred for its speed by daily newspapers; electrotyping by printers generally for its greater accuracy and its applicability to fine engravings in relief. Crude experiments at soldering composed types together and at making duplicates by the pressure of pages on type metal softened by heat were made in the eighteenth century, but the first practical work was done by William Ged, a goldsmith of Edinburgh, in 1725. His invention was not kindly received by the printers and publishers of England and soon fell into disuse, but it was revived and improved by Earl Stanhope, of London, about the year 1802. For nearly 50 years afterward it was preferred for bookwork, and was generally known as the plaster process. The page of type to be stereotyped was put in an iron pan and a preparation of plaster of Paris poured over it, which was afterward baked dry in an oven. The dried mold so made was then submerged in melted type metal that penetrated every crevice. When properly cooled the mold was broken, and a duplicate of the composed type appeared on one side of the plate. The rough side of the plate was planed down, its edges were beveled, and faulty letters corrected, until it became a presentable duplicate of the type work. Stereotyping by plaster was brought to Newark by David Bruce in 1813. Stereotypes have been made also by pressing the types upon prepared dampened china clay, but the clay process is rarely used. The papier-maché process, invented by Genoux of France, in 1829, was neglected for many years, but is now in favor with most daily newspapers. Sheets of thin tissue paper pasted together and backed with damp unsized thicker paper constitute the mold or matrix for the papier-maché process. They are firmly and evenly impressed on the page of type and are then dried upon the page. When dry the matrix is removed and adjusted to an iron mold on which melted type metal is poured from several openings. The plate so made is then cooled, planed, and beveled, and curved, if necessary, to fit the press. Newspaper stereotyping is now generally done by the autoplate machine, whose operation is entirely automatic. It is the invention of Henry A. Wise Wood, and was first used in 1900 by the New York *Herald*.

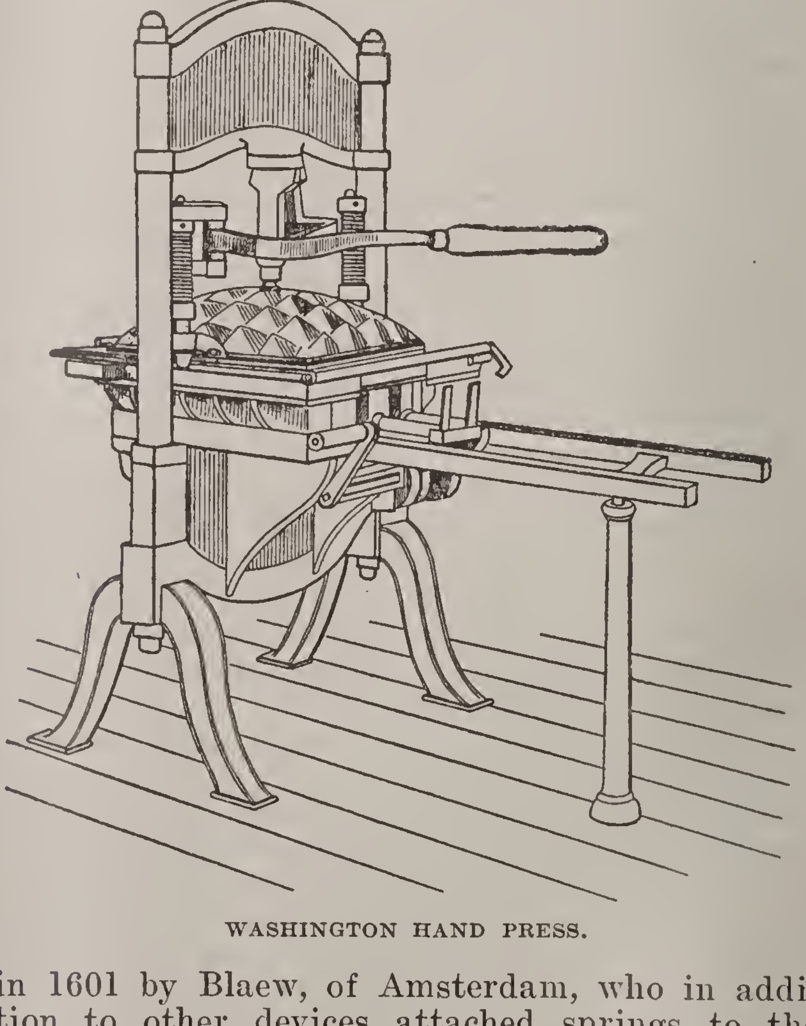
Electrotyping. For fine bookwork and for duplicating engraved illustrations, electrotyping is the process preferred. By this process the type page is impressed in a thin sheet of wax which is first dusted with a coating of powdered graphite and then with a coating of iron filings. The wax mold so prepared is immersed in a bath containing a solution of sulphate of copper through which passes an electric current from a dynamo. This deposits a thin film of copper on the wax mold. (See ELECTROCHEMISTRY, INDUSTRIAL.) When thick enough to be stable the film or shell of copper is backed with a solder of tin and afterward with a firmer basis of type metal applied in a melted state. This type-metal base is then planed and beveled, so that it can be neatly fitted to a thicker base of hard wood or of iron that makes it type-high. Electrotype plates may be curved by passing them through shapers or suitable bending rolls. Electrotype plates for printing were made by Joseph A. Adams, a wood engraver of New York City, in 1839–41, but they did not supplement stereotype before 1850.

Inking Rollers. Printing ink is a trituration (not a chemical union) of boiled oil, smoke black, coloring matter, and other ingredients. By the old process for inking types stuffed leather balls were made use of, but they were difficult to keep in proper order and were inapplicable to cylinder printing. The first improvement on the stuffed balls consisted in covering them with the elastic composition of glue and treacle then employed in the Staffordshire potteries. Catching at this idea, the inventors of cylinder printing machines made inking rollers by casting them in a cylindrical mold. This invention came generally into use between 1814 and 1818, everywhere superseding balls and rendering printing machinery practicable. Inking rollers for type work now made of a mixture of glue, glucose, sugar, and glycerin are found more durable than those made from glue and molasses only. The quantities of each constituent must be varied to suit the speed of the machine, the nature of the presswork, and the temperature of the pressroom.

Printing Presses. The earliest engraving of a printing press shows a stout framework of wood posts, firmly braced against the ceiling to resist upward pressure, a bedplate of stone as a rest for the form of type, which could be exposed to receive ink and then be slid upon ways under the platen or pressing surface. Impression was given by a large screw of wood over this platen, and this screw was moved by a long bar of wood and iron. The sheet of paper to be printed (about 16 × 20 inches was a common size) was laid upon an inclined framework of wood covered with blanket or parchment, which was hinged to slide on the ways and to be placed under the platen. This platen impressed only one-half of one side of the paper; to print the sheet 16 × 20 on both sides the pressman had to give four pulls on the bar. To print with uniform margin and in accurate register, the sheet on its first impression was pierced with small perforations on the front side and afterward suspended from holes so made on properly placed points when the second side was printed. Although the mechanism of the press was rude and even petty, good printing was done upon it by a competent pressman. The first improvement in construction was made in 1601 by Blaew, of Amsterdam, who in addition to other devices attached springs to the platen moved by the screw, so that it could have a quick return movement without special exertion from the pressman. In 1786 M. Pierres, of Paris, invented a printing press entirely of iron and strong enough to print one side of the

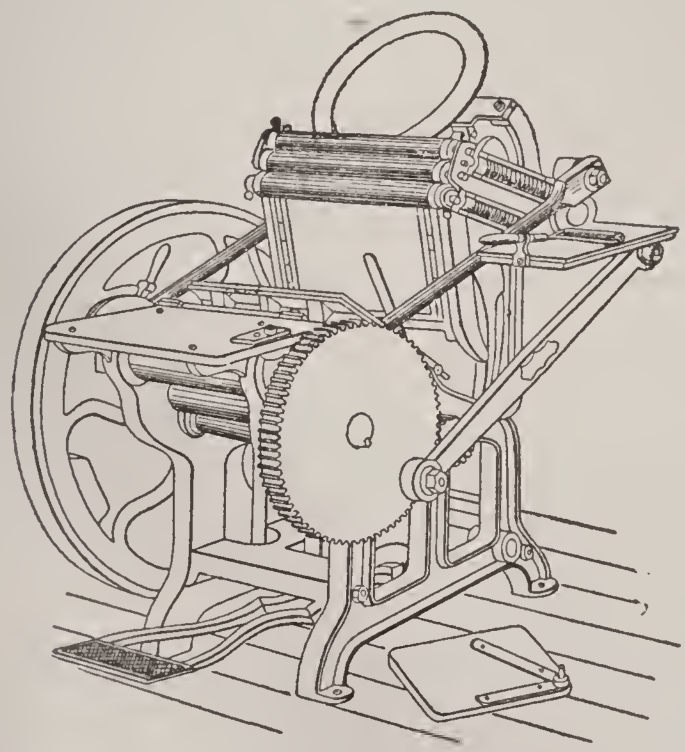


OLD COMMON PRESS.
p, platen; *s*, sole or bed; *t*, tympan; *f*, frisket.



WASHINGTON HAND PRESS.

sheet by one pull of the bar, but it did not meet with favor. About 1804 Earl Stanhope, of London, made great improvements on the large iron press of Pierres, adding many clever devices of his own for the lightening of labor. In 1806 Koenig, of Saxony, went to London with the model of an improved platen press, which he failed to introduce. His associates were more successful in reviving a patent issued to William Nicholson, of London, in 1790 for printing on a flat surface with cylindrical pressure. The new method was fairly tested upon a book form in 1811, and the new machine began to do the regular edition of the London *Times* in 1814—the first cylinder press driven by steam power. Soon after this newspapers adopted cylinder presses, for their greater speed and economy were advantages not to be neglected, but bookwork of all kinds continued to be done on platen presses of new construction. The Columbian press, invented by George Clymer, of Philadelphia (1816), the Adams power press, made in 1830 by Isaac Adams, of Boston, and the Washington press, of Rust, of New York, in 1827, were for many years the favorites. Cylinder printing machines, the first made, although indispensable to early newspapers, were damaging to type, and for that reason were rejected after fair trial by all book printers. The old publishing house of Harper and Brothers used hand presses only in 1835, but soon after introduced the Adams press. A prominent firm of law-book publishers in New York had all their work done on hand presses as late as 1849. The preference for hand-press work has been more marked in Great Britain. The fine books of Pickering and Whitingham and more recently those of William Morris and his disciples were printed on a hand press. The hand press was found too slow and the cylinder press too cumbrous and costly for the small forms of commercial printing required before 1850. To supply this demand many small and inexpensive platen printing presses were devised for cards and circulars. In 1840 S. P. Ruggles, of Boston, invented a platen machine that printed a sheet of letter size at the speed of 1000 an hour, power being furnished by the foot of the pressman moving a treadle and attached crank. In 1850 George P. Gordon, of New York, patented a form of small platen press in which the platen vibrated to the bed of type and printed small sheets with great speed and accuracy. This Gordon press, with some modifications as to parts and under various names, is still preferred in all printing countries for small jobs.



GORDON PRESS.

Cylinder presses impressing types upon a flat bed with a reciprocating movement are made of many different constructions: (1) the drum cylinder, that makes one revolution and one impression to the forward and backward movement of the bed of type; (2) the two-revolution cylinder, that rotates at greater speed and gives impression at every other rotation; (3) the stop cylinder, that stops its rotation after each impression; (4) the double cylinder, that produces two prints from the same form on each reciprocating movement of the bed; (5) the perfecting cylinder, that prints both sides of the sheet at the same operation; (6) the two-color press, that prints two colors on the paper as each sheet passes through. Other constructions, some of value, could be named, but those here specified are in most favor. The perfecting cylinder is the only construction of flat-bed press that attempts to print both sides at once, but its movement is relatively slow. The high speed required by daily newspapers can be had only by the full use of the rotary principle for the pressed and the pressing surfaces. In 1835 Rowland Hill, of England, devised a press on this plan purposed to print upon an endless roll of paper, but his scheme was never put to practical use. In 1850 Thomas Nelson, of Edinburgh, exhibited at the World's Fair a little cylinder which did print a handbill on both sides at great speed from this endless roll. It was not favorably regarded as a practicable apparatus. In 1865 William Bullock, of New York, constructed a rotary press which printed from an endless roll 10,000 copies in an hour. R. Hoe & Co., of New York, had produced in 1846 a type-revolving printing machine. In this construction a large central cylinder contained the form of type on a small portion of its circumference, the rest of that circumference being used for the movement of inking rollers. The types were held in place by grooved and rabbeted column rules and screw clamps. Around this large cylinder were placed at graduated distances 4, 6, 8, or 10 impression cylinders, for each of which separate piles of paper and separate feeders had to be provided. Every revolution of the central cylinder produced from 4 to 10 copies, but these copies were printed on one side only, and this fact limited its value as a newspaper machine. In 1871 R. Hoe & Co. invented a rotary press which printed on both sides from curved stereotype plates at the rate of 12,000 an hour. This machine, a favorite at the start, has been reconstructed on new lines with many improvements for the different requirements of 8-page to 48-page newspapers. Two or more distinct machines are geared together in one construction and are known as the quadruple, sextuple, octuple, double-sextuple, and double-octuple machines.

A sextuple press built for the New York *Herald* in 1889 was composed of about 16,000 pieces and weighed 116,000 pounds. This press was fed from three rolls of paper, and could print, cut, paste, fold, and count 24,000 papers of 14, 20, or 24 pages each, 36,000 papers of 16 pages each, 48,000 of 10 or 12 pages each, or 72,000 of 8 pages each during every hour of its daily operation. In 1900 three octuple presses were installed for the New York *Journal*, each press weighing, when in running order, about 200,000 pounds and having 11 pairs of printing cylinders, 40 ink-distributing cylinders, 100 composition rollers, 22 ink fountains, 5 sets of oil fountains, and 850 gear wheels.

These presses, which were operated by electricity, were 35 feet long, 10 feet wide, and 15 feet high. An 80-horse-power electric motor was required to start one of them from a state of rest until it attained its proper speed, after which it performed its work at a considerably less expense of power.

In these machines five-cylinder color presses were combined with a full black press, which also had extra facilities for turning out fine newspaper work from electrotype plates; consequently half-tone plates and colored illustrations could be printed in connection with the text.

The largest printing machine that was made up to 1915 was the Hoe double octuple with eight folders and eight deliveries. It was fed from eight rolls of paper, each roll the width of four newspaper pages, and when equipped with the improved Hoe high-speed internal-gear rotating-blade folding mechanism, introduced in 1908, was capable of turning out full-sized newspapers at the rate per hour of 300,000 copies of 8 pages, 150,000 copies of 16 pages, 75,000 copies of 32 pages, or a larger number of pages in proportion, all delivered folded, cut at the top, bottom, and side, pasted if desired, and counted in lots. A press of this character was composed of approximately 65,000 separate pieces, was 48 feet in length, 8 feet in width, 19½ feet in height, weighed about 350,000 pounds, and running at capacity consumed paper at the rate of 108 miles an hour of a web 6 feet in width. When desired, additional cylinders and ink fountains could be added to print in colors as well as black. Other rotary presses of merit are made in the United States and in France and Germany, but they contain no distinctive principle that calls for minute description.

Early in the twentieth century two ideas which present great possibilities were developed and put into use. These are the offset and rotogravure processes. The principle of the former, the offset, is allied to the principle of lithography, a rubber blanket receiving the impression and that in turn offsetting it on the paper. A rotary press which is capable of a speed of 4000 to 5000 impressions per hour is used for this work. The rotogravure process, introduced into the United States in 1912, is a mechanical adaptation of intaglio printing, the printing surface being sunk on engraved copper cylinders. The result is of the nature of a photogravure print, but run at a high speed instead of printed by hand. The rotogravure press is also a rotary press, and its greatest use at present, in the United States at least, is in the printing of illustrated supplements for the Sunday issues of metropolitan newspapers.

Paper. Improvements in paper-making have been great aids in the development of printing. In 1827 the Fourdrinier paper machine, that produced paper in the so-called endless roll needed for rapid newspaper printing, was introduced in the United States. It made paper of more uniform thickness, of larger size, and at lower price. Cotton rags were used until the supply diminished. In 1860 Henry Voeltner invented a method for grinding soft woods for conversion into paper pulp. His method has been improved by chipping the wood and treating it with suitable chemical agents which have largely reduced its cost. Book papers that sold for 16 cents in 1850 are now sold for 5 cents or less, but the quality is not so good. See PAPER.

The methods of book and news presswork have been seriously changed. Before 1870 the rough paper then in use had to be dampened before it was thought fit for press, and type work was impressed upon it against a thick woolen or rubber blanket, which produced thick and strong print. This elastic impression was fatal to engravings with close and shallow lines, which were choked with ink, to the damage of proper light and shade. Then paper makers began to provide paper with a smoother surface, and printers undertook to print this paper in its dry state. Soon after the newly discovered art of photo-engraving, which became common in books and magazines, compelled the making of still smoother paper. To supply this demand a thin fabric of paper was coated with whiting, which, after proper smoothing or calendering, had a surface as smooth as polished metal. To print photo-engravings on this paper the elastic impression resistance had to be abandoned and an inelastic resistance of hard cardboard substituted. Under this treatment the delicacy of fine lines in an illustration could be properly preserved; the inelastic resistance improved the appearance of the illustration, but it did not improve the readability of the type work, and it did add to the cost of presswork.

The increasing circulation of magazines that were filled with illustrations compelled the abandonment of the flat-bed cylinder press about 1884. The rotary principle then and now employed in newspaper work had to be adopted, but with finer mechanism nicely adjusted. In 1886 R. Hoe & Co. made for the printing of the *Century Magazine* a rotary press that took on 64 large octavo pages and printed them in a satisfactory manner and with a speed not possible by any form of flat-bed cylinder. Since then steady progress has been made in the development of rotary presses for printing and folding magazines, books, and periodicals, until now the great bulk of publications of that class are turned out on fast-running machines. These are sometimes equipped with automatic feeding mechanism for inserting and adding covers or insert sheets.

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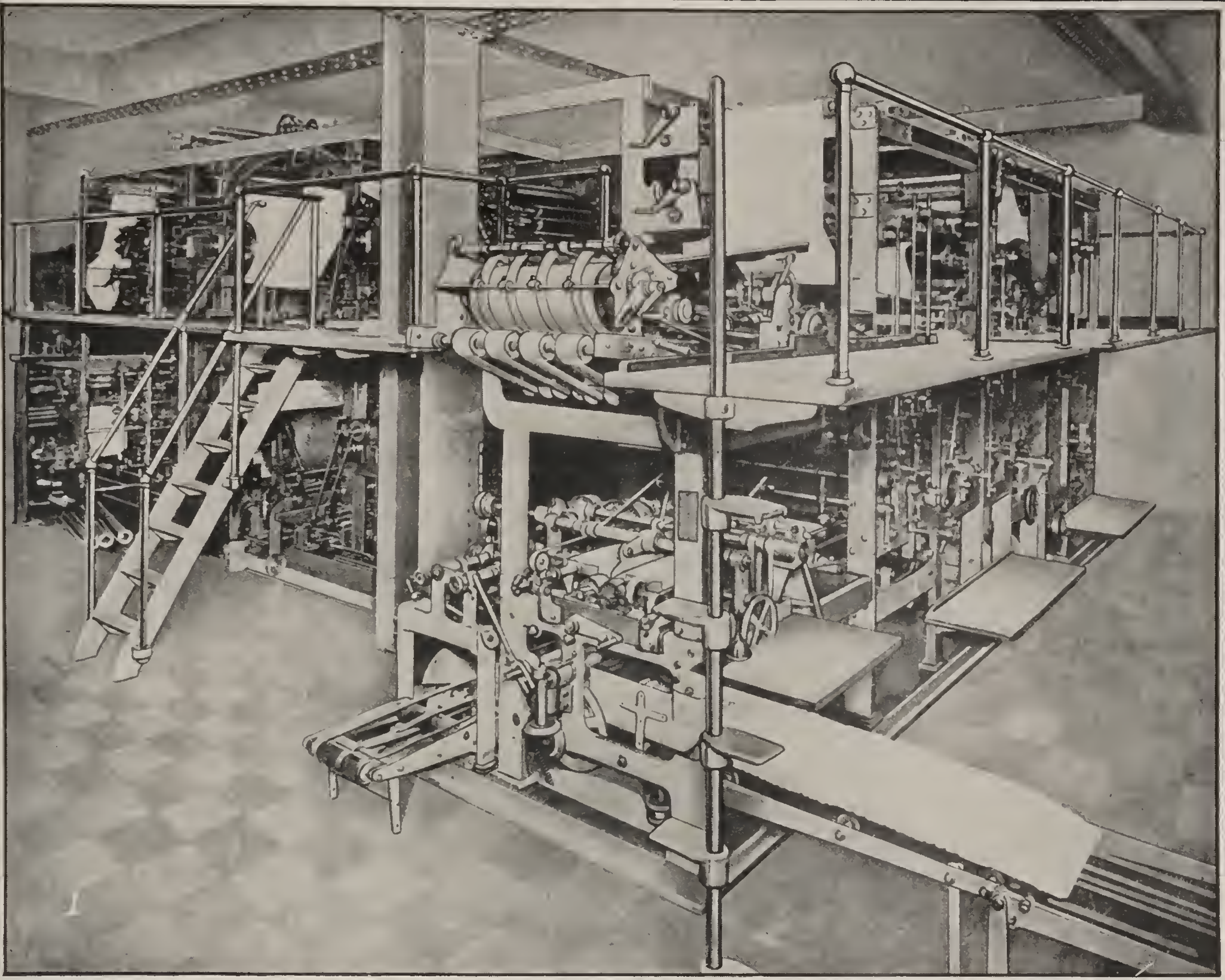
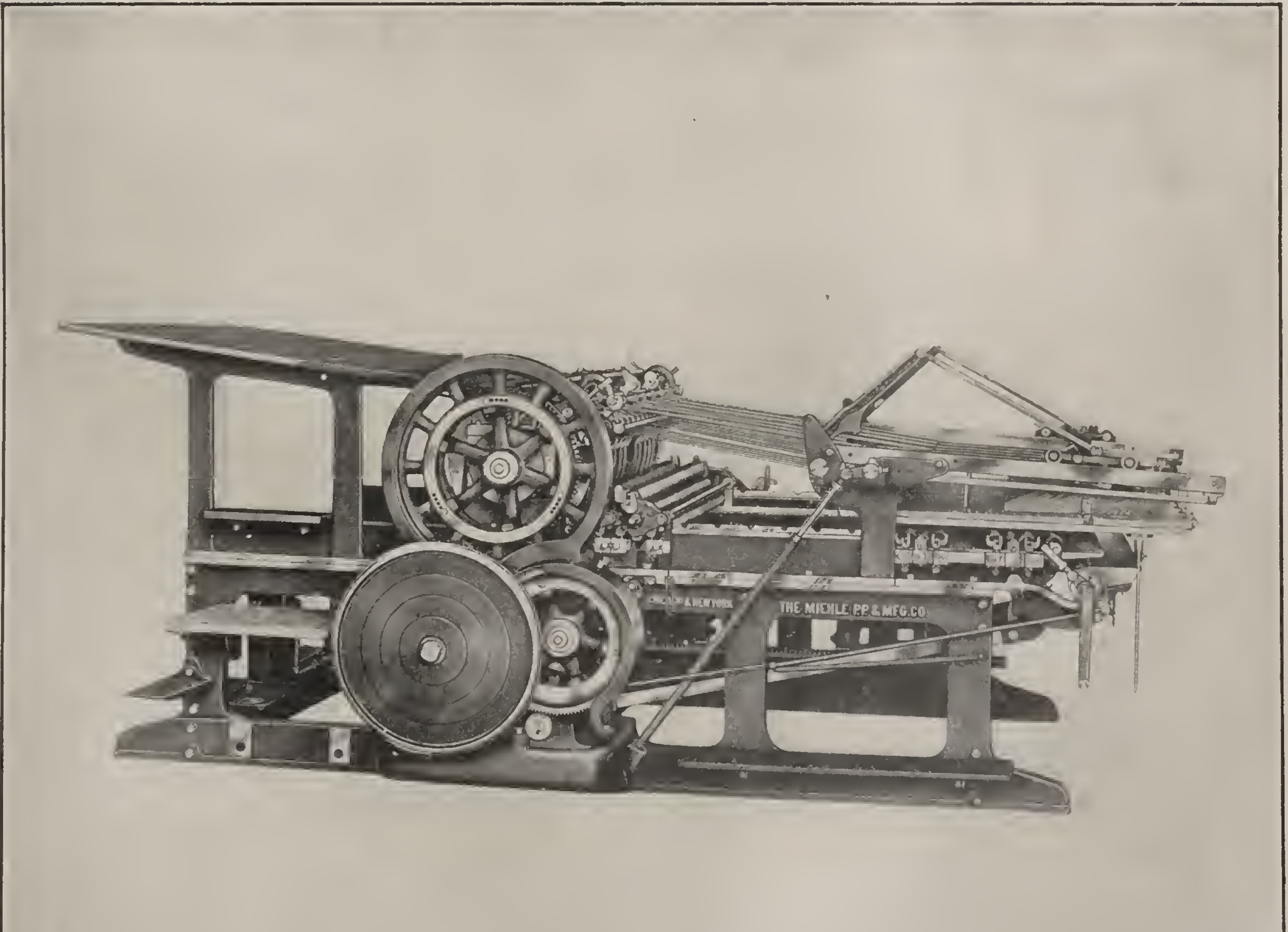
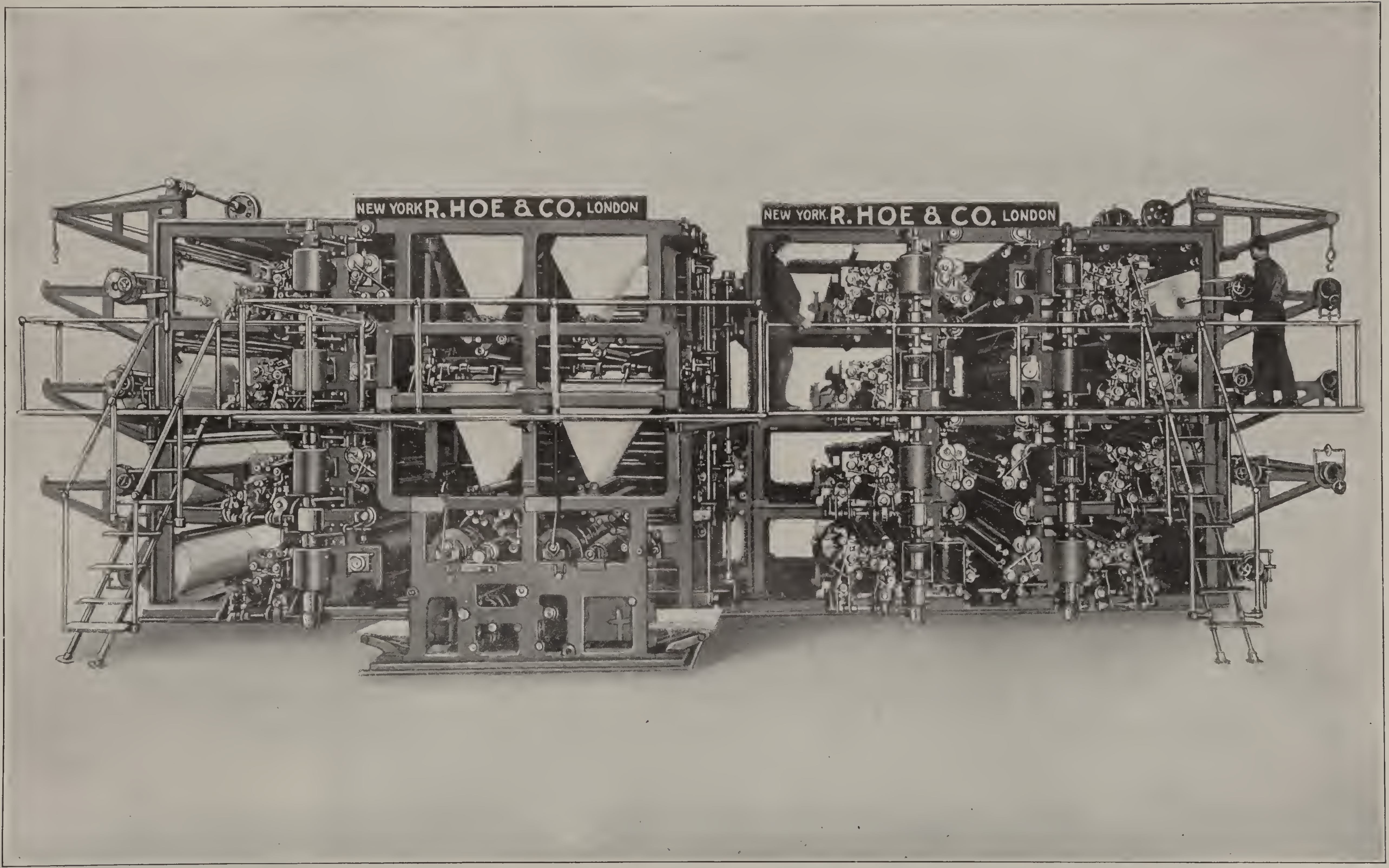
PRINTING





1. HOE TWIN COMBINATION ELECTROTYPE WEB PERFECTING PRESS FOR FINE PERIODICAL PRINTING.
Prints at the same time covers or inserts and delivers sheets folded and wire-stapled
2. MIEHLE FLAT-BED TWO REVOLUTION FOUR-ROLLER BOOK AND MAGAZINE PRESS



HOE UNIVERSAL-UNIT COMBINATION COLOR AND BLACK ROTARY NEWSPAPER WEB PERFECTING PRESS

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PRINTING, Textile. See Textile Printing.

PRINTING-HOUSE SQUARE. 1. A London court, so called from the former office of the King's printer, which occupied the site. On it stands the office of the *Times*. 2. The open square fronting on City Hall Park, New York, near which are the buildings of most of the daily newspapers.

PRINTZ, Johan (1592–1663). Governor of New Sweden. He was born in Bottnaryd, Småland, Sweden. He served as a cavalry officer in the Thirty Years' War and for having surrendered the Saxon town of Chemnitz was dismissed from the service, but in 1641 was restored to royal favor, was ennobled, and was appointed Governor of New Sweden. He reached Fort Christina in 1643 and, desiring to control the trade of the river and be as close as possible to the Dutch at Fort Nassau, he established a settlement on the island of Tinicum, a few miles below the site of Philadelphia, and built Fort New Göteborg and also a mansion called Printz Hall. His administration was a vigorous one, and during it the colony increased in numbers and in prosperity. He caused other forts to be built at various places, as Fort Elsingborg, for the protection of the colony, carried on a large trade with the Indians, and successfully maintained himself against the English and the Dutch. He quitted the colony in 1653, and two years later it was conquered by the Dutch under Stuyvesant. When Printz reached Sweden he was made a general (1654), and in 1658 he became Governor of the Province of Jönköping. Consult: J. R. Brodhead, *History of the State of New York* (2 vols., New York, 1853–71); Justin Winsor, *Narrative and Critical History of America* (8 vols., Boston, 1889); Herman Hofberg, *Svenskt Biografiskt Handlexikon* (2 vols., Stockholm, 1906).

PRINZIP, prĭn-tsēp′, Gavrio. A Bosnian student who shot and killed Archduke Francis Ferdinand of Austria and his wife, the Countess of Hohenburg, on June 28, 1914, at Serajevo, Bosnia. He was tried and on October 28 of the same year was sentenced to 20 years' imprisonment. Austria regarded Prinzip's act as evidence of a Servian plot and subsequently sent an ultimatum to Servia, the refusal to comply with which brought on the Great European War. See War in Europe.

PRI′OR. See Monastery.

PRIOR, Matthew (1664–1721). An English poet and diplomatist, born July 21, 1664, probably in Wimborne, Dorsetshire, where his father was a joiner. The family moved to London, and the young Prior was placed in Westminster School, where he formed a lifelong friendship with Charles Montagu, afterward Earl of Halifax. He graduated B.A. from St. John's College, Cambridge (1686), and was elected fellow (1688); through the influence of the Earl of Dorset he was made Secretary to Lord Dursley, Ambassador to The Hague, where he remained several years, enjoying the friendship of King William III; Secretary in the negotiations at the Treaty of Ryswick (1697); Secretary to the Embassy at Paris (1698); Undersecretary of State (1699); sat in Parliament (1701), and soon after forsook the Whigs for the Tories. He had a hand in the negotiations preliminary to the Peace of Utrecht and was for a short period Ambassador at Paris; on the advent of the Whigs to power he was impeached and imprisoned for two years (1715–17). His last years were passed at Down Hall in Essex. He died Sept. 18, 1721, and was buried in Westminster Abbey.

Prior gained recognition among the wits by *The Country-Mouse and the City-Mouse* (1686), written, nominally, in conjunction with Charles Montagu. It is a readable travesty on Dryden's *Hind and Panther*. In 1700 he published a panegyric on King William, called *Carmen Seculare*. While in prison he amused himself with a long whimsical poem, entitled *Alma; or the Progress of the Mind*. A collection of his poems appeared in 1709 and another in 1718. Prior's short poems, comprising odes, epistles, and epigrams, are among the choicest specimens of English occasional verse. Consult the *Selected Poems*, ed. by Dobson, Parchment Library (London, 1889); the edition by Johnson in the "Aldine Series" (ib., 1892); W. M. Thackeray, *English Humorists of the Eighteenth Century*, in "Standard English Classics" (Boston, 1911); Francis Bickley, *Life* (New York, 1914).

PRIPET, prĭp′ĕt (Russ. *Pripyat*, prĭ′pyăt-y′). A river of West Russia, the largest right tributary of the Dnieper. It rises in a group of lakes and marshes in the Government of Volhynia, near the boundary of Poland, and flows eastward through Volhynia and Minsk, then southeast into the Government of Kiev, where it joins the Dnieper some distance above the town of Kiev (Map: Russia, C 4). For the greater part of its course of 500 miles it flows through immense marshes and forests now in large measure drained and converted into meadows, which are almost uninhabited and through which the river and its branches form a network of side channels and backwaters. The Pripet is navigable to Pinsk and is connected by canals with the Vistula and the Niemen. See Poliessie.

PRISCA. See Priscilla and Aquila.

PRISCIAN, prĭsh′an (Lat. *Priscianus Cæsariensis*). In point of reputation the first of Latin grammarians, though one of the last in time. He belongs probably to about the early part of the sixth century, for he is mentioned by Paulus Diaconus (q.v.) as a contemporary of Cassiodorus. He taught Latin at Constantinople, probably at the Imperial court, for he enjoyed a government salary. The work which has mainly preserved his name is his *Commentariorum Grammaticorum Libri XVIII*, dedicated to his patron, the Consul Julianus. The first 16 books treat of the different parts of speech as conceived by the ancients; the remaining two are devoted to syntax and in one manuscript bear the separate title *De Constructione Libri Duo.* Priscian's Commentary is, for the time, a solid and comprehensive work, the production of a man of great learning and good sense, and is enriched with quotations from many Greek and Latin authors no longer extant. The epitome executed by the German Bishop, Rabanus Maurus, in the ninth century, was very popular in the Middle Ages. Besides the Commentary, Priscian wrote six smaller grammatical treatises, and two didactic poems in hexameter, *De Laude Imperatoris Anastasii,* and a free translation of the *Periegesis* of Dionysius. The first edition of the grammar appeared at Venice (1470); the best is that by M. Hertz, in vols. ii and iii of H. Keil, *Grammatici Latini* (Leipzig, 1855–59). The two poems will be found in vol. v of Baehrens's *Poetæ Latini Minores* (ib., 1883). Consult J. E. Sandys, *A History of Classical Scholarship,* vol. i (2d ed., Cambridge, 1906), and W. S. Teuffel, *Geschichte der römischen Litteratur,* vol. iii (6th ed., Leipzig, 1913).

PRISCIL'LA. The heroine of Longfellow's *Courtship of Miles Standish,* wooed by John Alden for his friend Standish, but won for himself.

PRISCIL'LA AND AQ'UILA. Two New Testament characters, wife and husband, intimate associates and helpers of the Apostle Paul. The name Priscilla is a diminutive of Prisca, the form found in the best texts in the three references to her in Paul's Epistles. The husband, Aquila, is described in Acts xviii. 2 as "a man of Pontus by race, lately come [to Corinth] from Italy, with his wife Priscilla, because Claudius had commanded all the Jews to depart from Rome." This decree was promulgated about 50 A.D. Like Paul, they were tent makers by trade (Acts xviii. 3). It is possible that Aquila and Priscilla had accepted the Christian faith before leaving Rome. They continued with Paul during his stay in Corinth, and went thence with him to Ephesus, but tarried there while he went on to Jerusalem (Acts xviii. 18, 19). At Ephesus they were instrumental in bringing the gifted Apollos to a fuller knowledge of the faith (Acts xviii. 21 ff.), and their home became one of the centres of Christian activity in that city (1 Cor. xvi. 19). From there they returned later to Rome (Rom. xvi. 3), where they may have been instrumental in securing for Paul's letter to the church of Rome a favorable reception. After Paul's second imprisonment they were again at Ephesus (2 Tim. iv. 19). These changes are quite consistent with the shifting character of Jewish life at the time and with their function as missionaries of the new faith. There are no reliable sources of information concerning the close of their lives. The name of Priscilla (Prisca) figures quite largely in later tradition. There is a church in Rome bearing her name, a volume of *Acts of Saint Prisca* goes back at least to the tenth century, and one of the oldest catacombs in Rome is called *Cœmeterium Priscillæ.* Why the wife's name is usually placed first in the New Testament is not clear. The interesting hypothesis, put forward by Prof. Adolf Harnack of Berlin in 1900, that the authors of the Epistle to the Hebrews were Aquila and Priscilla is ingenious, but not convincing. Consult Sanday and Headlam, *Epistle to the Romans,* in *International Critical Commentary* (New York, 1899), and Hastings, *Dictionary of the Bible,* vol. iv (ib., 1904).

PRISCILL'IAN (Lat. *Priscillianus* (?–385). A Spanish Christian, who, while still a layman, started a reform movement with the view of deepening religious life and encouraging asceticism. He afterward entered holy orders and was made Bishop of Avila in central Spain. His theology diverged from orthodoxy at some points, and in the end he was charged with holding Gnostic, Manichæan, and other heresies, although he himself disavowed the opinions of Manes. He seems, however, to have held peculiar views respecting the influence of the heavenly bodies upon men. He believed that the Church still possessed the gift of prophecy, and he gathered his followers into private assemblies, which lent color to the charge of sectarianism, later brought against him. A council at Saragossa (380) reproved the ascetic and separatist tendencies of the day and excommunicated Priscillian and three other leaders. This only intensified the controversy. His views were soon carried over into the Gallic church, and within 8 or 10 years of its first appearance the party included several bishops and a large number of the clergy. In the course of the controversy Priscillian appealed to Pope Damasus (c.382), and further appeals to the Emperor were made by both parties. After Priscillian had protested against the jurisdiction of a synod convened at Bordeaux (384), he was tried before a civil tribunal, condemned for sorcery, and put to death, along with six others, by the Emperor's command. The Priscillianists continued for some time longer in a state of schism and are found even as late as the sixth century. The literary remains of Priscillian are published in the *Corpus Scriptorum Ecclesiasticorum Latinorum,* vol. xviii (Vienna, 1889). Consult: H. L. Mansel, *Gnostic Heresies* (London, 1875); F. Paret, *Priscillian* (Würtzburg, 1891); K. Künstle, *Antipriscilliana* (Freiburg, 1905); E. C. Babut, *Priscillian et le Priscillianisme* (Paris, 1909).

PRISHTINA, prĕsh'tē-nȧ. A town of European Turkey. See PRISTINA.

PRISM (Lat. *prisma,* from Gk. *πρίσμα,* prism, something sawed, from *πρίειν, priein, πρίζειν, prizein,* to saw). A polyhedron (q.v.) two of whose faces (the bases) are equal polygons and whose lateral faces are parallelograms. When the lateral edges are perpendicular to its bases, the prism is called a *right* prism; otherwise it is said to be *oblique.* A *regular* prism is a right prism whose bases are regular polygons. A prism whose bases are parallelograms is called a *parallelepiped* (q.v.). The volume of any prism equals the product of the base and the altitude. Consult Holzmüller, *Elemente der Stereometrie* (Leipzig, 1902).

PRISM, DISPERSIVE EFFECT OF. See DISPERSION; LIGHT.

PRISMATIC EMERALD. See EUCLASE.

PRIS'MATOID (from Gk. *πρίσμα, prisma,* prism + *εἶδος, eidos,* form). A polyhedron (q.v.) which has for bases any two polygons in parallel planes and for lateral faces triangles or trapezoids which have one side in common with one base and the opposite vertex or side in common with the other base. The formula for the volume of a prismatoid is $\frac{1}{6}h(b + b' + 4m)$, where $h =$ height, b and b' are the bases, and

m is a mid-cross-section. Consult Holzmüller, *Elemente der Stereometrie* (Leipzig, 1902).

PRISON. See Prisons.

PRISON ASSOCIATION, American. An organization formed under the leadership of Dr. E. C. Wines, composed of State officials, well-known philanthropists, and students interested in the betterment of criminal laws, the improvement of penal and correctional institutions, and the care of discharged prisoners. The association was founded in 1870 at Cincinnati, incorporated in 1871 under the laws of New York, and reports of its proceedings were published in 1872, 1874, and 1877. With the death of Dr. Wines, the association became virtually inoperative, but a new organization was effected in 1883, and meetings have been held annually since, with an executive committee. The other standing committees are on criminal-law reform, prevention, probation, parole, prison discipline, discharged prisoners, statistics. Associated with the American Prison Association are five other national organizations composed of prison wardens, prison physicians, prison chaplains, women in prison work, and clinical criminologists.

PRISON BREACH, or Prison Breaking. The crime of escaping by force and violence from a place where one is confined in lawful custody. The act is a misdemeanor, and to constitute it there must be a lawful commitment, an actual breaking of the prison by force and violence by the prisoner or by others in his behalf and by his procurement, and he must fully escape, although, of course, subsequent recapture does not affect his act of breach. Similar escape by the violence of others without his procurement is a *rescue*. See Criminal Law.

PRISON BUILDINGS. In the article Prisons (q.v.) brief reference is made to early prison buildings at Ghent and at Philadelphia. Since their construction much study has been bestowed upon the problem of prison architecture, and considerable progress has been made. This problem is, however, so intimately involved with that of prison administration, and the whole science of penology is now in such a state of transition, that entirely new developments may be looked for in the near future.

Prison buildings comprise not merely the blocks of cells and the necessary adjuncts—refectory, baths, etc.—but also workshops, inclosures for exercise, chapel, hospital, lodgings for wardens and guards, and other accessories. The architect's problem consists in so relating these to one another as to provide perfect supervision, security, and correct sanitation. The cells are usually arranged in blocks of three to five tiers, opening on galleries or balconies, in a corridor of the full height of the building. In one type the cells in two rows, back to back, face the outer walls, which light the two corridors adjoining them and also the galleries. In the other the cells are built against the outer walls and face on both sides of the high corridor, which is between the galleries. When several blocks of cells are required, they usually radiate from a central rotunda. The size, lighting, and equipment of the cells vary greatly; likewise the provisions for insuring supervision (as by open-barred doors) on the one hand and preventing conversation and noise on the other. There is also considerable difference in the character of different prisons with relation to the isolation of the prisoners; in some cases large cells are provided, in which prisoners of a certain class or grade may be confined in pairs or in small groups.

The modern tendency towards prison farms and colonies may in time do away with the present systems of huge, gloomy, stone cell blocks, substituting groups of smaller buildings in which, by a more normal mode of life, the prisoners may be better brought under reformative influences. For the details of prison design and distinctions between reformatories, state prisons, workhouses, penitentiaries, etc., also bibliography, see Prisons.

PRISON CONGRESS, International. See International Prison Congress.

PRISONER. A person who is confined, or restrained in his liberty, either with or without legal authority, against his will; a person subjected to imprisonment. The term is ordinarily used to designate persons who have been taken into custody and confined in criminal or quasi-criminal proceedings and persons who are captured in war. The status of prisoners of the former class is treated elsewhere in this work. See Convict; Imprisonment; Prisons; Penology.

Prisoners of War. Among the ancient Greeks and Romans, and for centuries before and since, prisoners taken in war were the property of those by whom they were captured and might be slain, kept as slaves, or sold, at the caprice of their captors. This is still the case among savage races and among some of the semicivilized races of the Orient. The custom of ransoming, together with the use of mercenaries and professional soldiers, mitigated the hardships of prisoners of war, and these have in modern times been further alleviated under the influence of humane feeling and considerations of policy. Under the rules laid down by the Brussels Conference in 1874, which have been generally accepted, a prisoner of war is a lawful combatant who is captured or surrenders in war, and such noncombatants as guides, telegraph operators, and others who are identified with the army and rendering it direct service, and important public officials. Surgeons and chaplains and, now, the hospital attendants of the Red Cross Society are exempt as such from capture as prisoners of war. A prisoner of war has no protection from the laws of the state and no civil remedy, but he is protected by the rules of international law against unlawful acts against his person. See International Law, *Land Warfare;* Geneva Convention; War, *Prisoners of War;* and consult the authorities there referred to.

PRISONER OF CHILLON, shĭ-lŏn′ *or* shĭl′on, The. A poem by Byron (1816), founded on the history of François de Bonnivard.

PRISONERS, Calendar of. See Calendar, in Law.

PRISON LABOR. See Convict Labor.

PRISONS (OF., Fr. *prison*, from Lat. *prensio*, seizure, from *prendere*, *prehendere*, to seize, take, from *præ-*, before + *-hendere*, Gk. χανδάνειν, *chandanein*, to seize; connected with Goth. *bi-gitan*, to find, OHG. *firgezzan*, Ger. *vergessen*, to forget, AS. *gitan*, Eng. *get*). Prisons have been used from antiquity as places of detention or seclusion, but only in modern times as places of punishment for crime. Of the former class were the famous Tower of London, the Bastille of Paris, the Bicêtre, the Seven Towers of Constantinople, and the castle of Spielberg in Austria. In the sixteenth century workhouses were erected in England and also on the Continent to which vagrants were committed: London (1550), Amsterdam (1588), Nuremberg (1588). There was at first little classification, and conditions were bad. Gradually, however, improvements were introduced. The rules and regulations necessary to the sheltering and employment of vagrants developed into prison discipline, while the necessity for classification led to the development of prison architecture. Imprisonment under the new conditions came to be viewed in a different light and thus became a recognized punishment for crime.

Prisons were first looked upon as a possible means of reformation in 1704, when Pope Clement XI established the Hospital of St. Michael at Rome. This was not strictly a prison, but in the criminal wards the plan was introduced of having separate cells at night with work in common by day, silence being maintained. This plan is the basis of what is now known in America as the Auburn plan. A prison which became the architectural prison model for western Europe and America was constructed at Ghent in 1773. The cells were in blocks, tier upon tier, radiating from a central octagon. The corridors were thus against the outer walls. This probably suggested the form of the Eastern Penitentiary at Philadelphia, in which, however, the corridors were placed in the centre of the blocks of cells, as at St. Michael's. These plans, which make the entrance to each cell visible from the central room, have been adopted in many later prisons. Beccaria (q.v.), in his great *Treatise on Crimes and Punishments* (1764), protested effectively against barbarous punishments, and John Howard (q.v.), who spent 16 years in visiting the prisons of Europe, was able to effect radical changes in the prison régime of England. Two plans were henceforth followed. In one the prisoners are separated. They eat, work, and sleep in their cells apart from all other inmates. This is theoretically the policy of the Eastern Penitentiary of Pennsylvania and that adopted in Europe. By the other plan the men have separate cells, but work and often dine together. This is the common plan in America. In either case much of the corrupting influence attendant upon the intermingling of prisoners is to a large extent avoided. Early prison conditions in America were exceedingly bad. At Simsbury, Conn., an abandoned copper mine was used as a State prison from 1773 to 1827. Reform began with the building of the Eastern Penitentiary at Philadelphia in 1817 and the Auburn State Prison of New York (1816), which became the models for American prisons. Between the two systems fierce rivalry arose, but after many trials the Auburn plan has been generally adopted. With the introduction of steam heat, electric lights, and modern sanitary conveniences, prisons have been greatly improved. About the prisons are usually high walls on which guards are stationed, while the electric lights make undetected escape over the walls by night extremely difficult.

Prison management and discipline have not kept pace with mechanical improvements. The old forms of torture and barbarous punishment have, however, disappeared, while escapes are relatively infrequent. In the larger institutions there is great reluctance to tolerate idleness, which is always found to be demoralizing in the extreme. The question as to the proper occupation of the convict, however, is difficult of solution. (See Convict Labor.) Inefficient management often destroys many of the good influences which modern penology demands shall surround the prisoner. Trained men are more and more needed both for efficient financial management and for wise discipline.

Places of imprisonment in the United States include lock-ups, jails, and prisons proper. In each town or city are local lock-ups, calabooses, or police stations for the detention of arrested persons pending immediate trial before the magistrates. Persons convicted of misdemeanors are confined in the county jails or houses of correction. Presumptive felons, bound over to the grand jury, are kept in the county jails pending trial, and then, if sentenced, are confined in the State penitentiaries. United States prisoners are usually kept in State institutions, as the general government maintains only a few prisons. As a rule, county jails are breeding places of crime. The houses of correction are better managed. Few county jails provide work for prisoners. In some of the States the prison system is not yet well worked out. These institutions are for adults. There are also reformatories (q.v.) for younger delinquents. There is a general feeling that local jails should be given up, and that all prisoners should be under State control, as in England, where the general government assumed control of all prisons in 1878.

The question of prison reform has received much attention in America as well as in Europe. The National Prison Congress, the National Conference of Charities and Correction, as well as local organizations, have had great influence in the past in bringing about improvements. The meetings of the International Prison Congress (q.v.) have been of great value.

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PRISREND, prĕz′rĕnd. The capital of the department of the same name in the Kingdom of Servia, situated on a small affluent of the Drin, 75 miles east of Scutari (Map: Balkan Peninsula, C 3). It is one of the most beautiful towns in Servia, ranking next in population to Belgrade, Nish, and Uskub. It has a citadel (situated 1100 feet above sea level) and a large number of bazars and carries on an active trade in flints, saddlery, glass, and copper and steel wares. Among its edifices are 24 mosques. The town is the seat of a Roman Catholic archbishop, an Orthodox metropolitan, and a Servian theological school. Long the capital city of the Ottoman Vilayet of Kossovo, it was captured by Servian troops in the course of the Balkan War (q.v.) of 1912 and confirmed to Servia by the Treaty of Bucharest (Aug. 6, 1913). It was captured by the Bulgarians in the European War which began in 1914 (see War in Europe). Pop., 1911, 21,244.

PRISTINA, prĕsh′tē-nȧ, or **PRISHTINA.** A town in the department of the same name in the Kingdom of Servia, 30 miles north-northeast of Prisrend (Map: Balkan Peninsula, C 3). It has several mosques and churches. After remaining for a long time under Turkish rule, it was captured by Servian troops on Oct. 22, 1912, in the course of the Balkan War (q.v.), and was confirmed to Servia by the Treaty of Bucharest (Aug. 6, 1913). Pristina was captured by the Teutonic allies in the war which began in 1914. Pop., 1911, about 10,000.

PRITCH′ARD, Charles (1808–93). An English astronomer, born in Alberbury, Shropshire. He was educated at Christ's Hospital and at St. John's College, Cambridge. From 1834 to 1862 he was head of Clapham Grammar School and in that period became a prominent member of the Royal Astronomical Society. Elected Savilian professor of astronomy at Oxford in 1870, he planned the new observatory, invented the wedge photometer about 1881, and in 1885 published *Uranometria Nova Oxoniensis,* a photometric catalogue for which in 1886 he received half of the Astronomical Society's medal. The measurement of stellar parallax by photography seems original with Pritchard. He died very soon after undertaking a share in the international stellar chart. He contributed to the *Encyclopædia Britannica* and wrote *Occasional Thoughts of an Astronomer on Nature and Revelation* (1889). Consult Ada Pritchard, *Memoirs of the Life of Charles Pritchard, D.D.* (London, 1897).

PRITCHARD, Mrs. Hannah (1711–68). An English actress. She was found in 1733 singing in a booth at a public fair; from that time she appeared at the Haymarket and other London playhouses till, for the last 20 years of her life, she became a member of Garrick's company at Drury Lane. Though lacking in cultivation, she was an actress of great gifts in both comedy and tragedy. She played Cleopatra in *All for Love,* Zara in *The Mourning Bride,* and many other noted characters of the time. Her last appearance was in Lady Macbeth, her most famous rôle, in which only Mrs. Siddons could surpass her. A few months after her retirement, in 1768, she died at Bath, wealthy and universally respected. Consult Doran, *Annals of the Stage* (ed. Lowe, London, 1888).

PRITCHARD, Jeter Connelly (1857–). An American legislator and jurist, born at Jonesboro, Tenn. He was early apprenticed to a printer. In 1873 he removed to Bakersville, N. C., where he became editor of the *Roan Mountain Republican.* He was several times a member of the State Legislature and was admitted to the bar in 1887. Pritchard served as a Republican member of the United States Senate in 1894–1903. He was a leader in the attempt to build up a white Republican party in the South, the so-called Lily-White movement, claiming that, as the negro had been deprived of his vote in many of the States, it was unfair that he should control conventions and keep away desirable recruits from the ranks of business men. In 1903 Pritchard was appointed associate justice of the Supreme Court of the District of Columbia, in 1904 justice of the United States Circuit Court, and in 1912 a judge of the newly created United States Circuit Court of Appeals.

PRITCH′ETT, Henry Smith (1857–). An American astronomer and educator, born at Fayette, Mo. After his graduation from Pritchett College, Glasgow, Mo., in 1875, he went to Washington to study practical and theoretical astronomy under Prof. Asaph Hall in the United States Naval Observatory, where he became assistant astronomer in 1878. Two years afterward he was appointed to the same position in the Morrison Observatory, Glasgow, Mo. He was sent to New Zealand in 1882 to observe the transit of Venus, and in 1883–97 was professor of astronomy at Washington University, St. Louis, Mo., and director of the observatory there. In 1889 he went to California in charge of the government expedition for viewing the solar eclipse. He was superintendent of the United States Coast and Geodetic Survey, with headquarters at Washington, in 1897–1900, and was president of the Massachusetts Institute of Technology, Boston, from 1900 to 1906, when he became administrative head of the Carnegie Foundation for the Advancement of Teaching.

PRITHU, prĭt′hōō. The name of several legendary kings of ancient India, especially one who is a hero in the Puranas. See Purana.

PRIVAS, prē′vȧ′. The capital of the Department of Ardèche, France, 95 miles south by west of Lyons by rail (Map: France, S., J 4). The town is built upon a ridge overlooking the valley of the Ouvèze, at the foot of Mont Toulon (1400 feet), and has a fine esplanade shaded with plane trees, opening upon a panorama of great extent and beauty. It has important iron mines, the ore of which is exported, and it manufactures silks, woolens, leather, and brandy. Its buildings are unimportant. It was a Huguenot stronghold and was destroyed in 1629 by order of Louis XIII and Richelieu. Pop., 1901, 7561; 1911, 7290.

PRIVATDOCENT, prē-vät′dō-tsĕnt′ (Ger., private teacher). A private instructor in German and some other European universities. The privilege to give instruction thus is acquired by promising scholars, holding the doctorate, after going through the process technically known as habilitation. This process consists in publicly defending a scientific dissertation embodying the results of the candidate's original research. Usually the privatdocent draws his fees from the students.

PRIVATE (Lat. *privatus,* individual, p.p. of *privare,* to separate, from *privus,* one's own, from *præ,* OLat. *prai,* before). In the United States army all enlisted men, except the noncommissioned officers, are termed privates and are so carried on the muster and pay rolls except where enlisted for a special duty, as in the case of firemen, cooks, farriers, horseshoers, saddlers, wagoners, trumpeters, musicians, artificers, mechanics, etc. See Army Organization; and for pay, see Pay and Allowances.

PRIVATE BILL. In English parliamentary procedure, a bill whose object is to alter the law relating to some particular locality or to confer rights on or to release from liability some particular person or persons, whereas a general bill is one whose object is to alter the general law of the land. The distinction exists in all legislative systems, but the scope of private-bill legislation is wider than that of the corresponding special, or private, act in most American legislatures. It deals largely with the grant and regulation of franchises, including the incorporation of companies and even the grant of municipal charters. A private bill in Parliament is initiated by petition and is usually an expensive matter. Being regarded as a privilege, heavy fees are required of the promoters at the several stages of its passage through Parliament.

A private bill is to be distinguished from a private member's bill, which is a bill (i.e., any bill, whether private or general in character) which is introduced by a private member of Parliament as distinguished from a member of the government. Consult Sir C. P. Ilbert, *The Mechanics of Law Making* (New York, 1914). See BILL; LEGISLATION; PARLIAMENT; STATUTE.

PRI'VATEER'ING. One of the usages of war according to which private individuals are authorized by the government of one belligerent to fit out at their own expense vessels of war designed to prey upon the commerce of another belligerent. A privateer is an armed vessel fitted out for this purpose, owned and officered by a person or persons acting under a commission usually called a letter of marque. (See MARQUE, LETTERS OF.) Citizens of the United States are forbidden to accept letters of marque from powers at peace with the United States, and this is a general rule among nations. The commission is revocable upon proof of abuse, and according to English law the holder is liable in damages. As a further safeguard, a privateer is always subject to visitation and search by public vessels of war with a view to the verification of the genuineness of the commission under which it sails.

The practice of privateering is an old one among nations. In Europe it runs back to the time when public navies had not come into existence. During the Middle Ages European states having few or no ships of war hired merchant vessels for the uses of war, and eventually the practice of issuing commissions to persons who owned ships or could procure them, authorizing them to prey upon the commerce of the enemy, came into general use. By way of compensation the person so commissioned was allowed a share of the booty which he might capture. Such means enabled an inferior maritime power to call into existence on brief notice and at little or no expense a temporary force sufficient to enable it to cope with a more powerful rival. It was by this means that the Southern Confederacy during the Civil War drove the merchant marine of the United States from the high seas and seriously crippled its commercial interests. The practice is still sanctioned by international law, but it is rapidly falling into disfavor and is not likely to be again extensively resorted to by any civilized nation. Consult E. S. Maclay, *History of American Privateers* (New York, 1902), and E. P. Statham, *Privateers and Privateering* (Philadelphia, 1910). See DECLARATION OF PARIS.

PRIVATE INTERNATIONAL LAW. See CONFLICT OF LAWS.

PRIV'ET (probably a corruption of *primet*, apparently from *prim*, privet, from Lat. *primus*, first, so called in allusion to its early bloom), *Ligustrum*. A genus of shrubs and small trees of the family Oleaceæ. Common privet (*Ligustrum vulgare*), a shrub growing about the borders of woods in the middle and south of Europe, is naturalized in some parts of North America. It has half-evergreen, smooth, lanceolate leaves, and black, rarely white, yellow, or green berries about the size of peas. The flowers have a strong and sweetish smell. The berries, which persist during winter, have a disagreeable taste, but serve as food for birds. Privet, though spineless, is much used for hedges, since it bears clipping well and withstands the smoke and shade of towns. It is not fully hardy in Iowa and adjoining States, though introduced Russian forms seem able to withstand the winters. The so-called California privet (*Ligustrum ovalifolium*), a native of Japan, is one of the best varieties for hedges. All species grow readily from cuttings.

PRIVET WEBWORM. The larva of a pyralid moth (*Diaphania quadristigmalis*), which feeds upon privet hedges in the United States. The soft, light-green eggs are fastened to the leaf near its midrib in clusters of 50 or more. The light-green caterpillars hatch in early summer and feed upon the young leaves, hiding themselves in silken webs either between the upper leaves when still quite small or lower down on the older leaves when fully grown. After three weeks they transform to the chrysalis condition within silken cocoons in folded leaves. The best remedy consists in trimming the hedge at the proper time and afterward applying an arsenical spray.

PRIV'ILEGE (Lat. *privilegium*, prerogative, from *privus*, one's own + *lex*, law). In law, a benefit or immunity growing out of some special rule of law or statute by virtue of which an individual or a class enjoys certain immunities or rights distinct from or beyond those enjoyed by the community in general. It differs from a *dispensation* inasmuch as the latter merely relaxes the existing law in a particular case, while the privilege is a permanent and general right. Of ancient and mediæval legislation the law of privilege formed an important branch, the so-called privileged classes being governed by a substantially different body of law from the other classes of society. In early law there were two privileges enjoyed by the clergy which deserve special notice from the frequency of the historical allusions to them—the "privilege of the canon" (*privilegium canonis*) and the "privilege of the forum" (*privilegium fori*). By the former the person of the clergyman, of whatever degree, was protected from violence by the penalty of excommunication against the offender; by the latter—known in England as "benefit of clergy"—the clergyman upon claiming his privilege was exempted from trial by the ordinary civil tribunals and could only be tried in the ecclesiastical court. Early English statutes placed limitations upon this latter privilege, and it was finally completely abolished. (See BENEFIT OF CLERGY.) In modern law there is scarcely any trace of the various forms of class legislation which characterized the Middle Ages, and in all of the United States class legislation is forbidden or restricted by their respective constitutions. Privileges in the legal sense so far as they exist at all in modern law rest upon grounds of public policy and in certain cases in the United States are sanctioned by provisions of the State and Federal constitutions.

Some forms of privilege have been considered in connection with other topics, in the law of which they constitute an essential part. Thus, for a discussion of *privileges of witnesses*, i.e., the circumstances under which witnesses are privileged from giving testimony, see EVIDENCE; WITNESS. For a discussion of the privilege which exempts one from liability for libel and slander, see LIBEL. See also MONOPOLY, and for the special privileges accorded to ambassadors and diplomatic agents by international law, see those topics respectively.

Privileges of Legislators. It is essential to the maintenance of free government that members of legislative bodies should be privileged from arrest, both civil and criminal, during the term or session of the Legislature, and for a reasonable time before the beginning and after the end of the session, and that they should not be called to account for any language uttered by them in the course of legislative business. Such is the common law relating to members of Parliament. The United States Constitution provides (Art. I, Sec. 6) that the Senators and Representatives "shall in all cases, except treason, felony, and breach of peace, be privileged from arrest during their attendance at the session of their respective Houses, and in going to and returning from the same, and for any speech or debate in either House they shall not be questioned in any other place." This provision has been substantially incorporated into the constitutions of the several States as applicable to the members of State Legislatures.

Privileges and Immunities of Citizens. The Constitution of the United States nowhere undertakes to enumerate the privileges and immunities of citizens of the United States, although the Fourteenth Amendment assumes that there are such, and expressly prohibits the States from making or enforcing any law which shall abridge them. The Civil Rights Act declares that they include, among other things, the right to make and enforce contracts, to bring suit in the courts, to give evidence, to inherit, purchase, lease, hold, and convey real and personal property, and to enjoy the full and equal benefit of all laws and proceedings for the security of person and property. The Supreme Court of the United States, in the noted Slaughter House cases, decided in 1872 (16 Wallace's U. S. Reports, p. 36), undertook to enumerate some of the more important of the privileges and immunities of United States citizens. According to the opinion of the court they include a citizen's right of free access to the seat of government of the United States in order to assert any claim he may have upon that government, to transact any business he may have with it, to seek its protection, to share its offices, to engage in its administrative functions; free access to the seaports, the subtreasuries, land offices, and courts of justice; protection of life, liberty, and property when on the high seas or within the jurisdiction of a foreign government; the right to assemble peaceably and petition for redress of grievances; the privilege of the writ of habeas corpus; the right to use the navigable waters of the United States; all rights secured to its citizens by treaties with foreign nations; the right to become a citizen of any State of the Union by a bona-fide residence therein, with the same rights as other citizens of that State, etc. In the decision above cited the Supreme Court declared that there is a citizenship of the United States distinct from that of the State, and that only the privileges and immunities appertaining to United States citizenship are under the guardianship of the national authority, and that those appertaining to State citizenship must rest for their security and protection upon the law of the several States. With regard to the latter the Constitution provides that the citizens of each State shall be entitled to all privileges and immunities of citizens in the several States. No complete enumeration of these has ever been attempted. See T. M. Cooley, *General Principles of Constitutional Law in the United States* (3d ed., Boston, 1898).

PRIVILEGED COMMUNICATION. A term applied to two distinct classes of statements. First, communications between parties occupying a confidential relation to one another, which the law does not force the recipient to disclose as a witness. Examples of this class are statements made by a client to his lawyer, by a patient to his physician, those between husband and wife, those between a party and a witness in preparation of a case for trial, and state secrets. They are frequently called confidential communications. The extent to which they are privileged is generally regulated by statute in the United States.

Second, statements which are defamatory, but which do not give to the injured party a right of action. Statements of this sort are of two kinds, absolutely privileged and conditionally privileged. Members of Parliament, of Congress, and of the State Legislatures are not to be questioned in any other place than their respective Houses for any speech or debate made therein. (See United States Constitution, Art. I, Sec. 6.) Judges also enjoy an absolute privilege from civil action for anything said or written by them as judges. This rule is not made for the protection or benefit of a malicious or abusive judge, but for the benefit of the public, whose interest it is that judicial officers should be at liberty to exercise their functions with independence and without fear of consequences. Similar considerations of public policy have led the English courts to accord the same absolute privilege to the pleadings of litigant parties, to the remarks of counsel, and the statements of witnesses, in the course of judicial proceedings. In the United States, however, the courts have generally held the privilege of such persons to be conditional and not absolute. That is, they are not liable in a civil action unless their defamatory statements are not pertinent or material to the case at issue, but are made in bad faith and for a malicious purpose.

A conditionally privileged communication is a defamatory statement made by a person in the discharge of some public or private duty, whether legal or moral, or in the conduct of his own affairs in a matter where his interests are concerned. The publication of legislative and judicial proceedings by newspapers belongs to this class. So do statements made by a lawyer to a client about the solvency of a third person with whom the client is about to engage in business transactions. Communications by a parent to a daughter of full age about the reputation of a suitor are also in this category, as are the warnings by a master to his servants about the character of a fellow servant, or the statements of an employer about those who have been in his service. In all of these, and in similar cases, the plaintiff must show that the defendant uttered the defamation in bad faith and for a malicious purpose, or he will fail in his action. Consult Hageman, *Privileged Communications* (Somerville, N. J., 1889). See DEFAMATION; LIBEL; SLANDER.

PRIVILEGED DEBTS. In Scots law, those debts which must be paid first out of bankrupt's, insolvent's, and decedent's estates, corresponding to the class of debts called preferred claims or debts in the United States.

PRIVILEGED DEED. In the law of Scotland, a holograph deed, which is exempted from the statute requiring deeds to be signed before witnesses.

PRIVILEGES. See STOCK EXCHANGE, *Stock Exchange Terms.*

PRIVILEGIUM CLERICALE. See BENEFIT OF CLERGY.

PRIVY (prĭv′ĭ) **COUNCIL.** In England, the assembly appointed by the sovereign to give advice on matters of state. In Anglo-Saxon times the kings had been advised by the Witenagemot, and in Norman times this became the Great Council. Naturally the kings had more intimate counselors, and they separated in time from the larger body to form the Privy Council. There are traces of such a body as early as the minority of Henry III, but the institution did not become definitely fixed until the minority of Richard II. During the reign of Henry V the name Privy Council first appears, and in the time of Henry VI this became the official designation.

The period of the greatest power of the Privy Council was during the infancy of Henry VI. It came into frequent collision with Parliament, which was jealous of its power. Its sphere of action was very wide. As a deliberative body it gave advice to the crown on political questions. It exercised legislative, judicial, and executive functions. Originally its judicial powers were very great. It frequently assumed cognizance of questions of private right, but in 1640 it was enacted that neither King nor Council should have any jurisdiction in matters regarding the estates and liberties of the subject, which should be tried in the ordinary tribunals of the land. Under the Tudors the Privy Council became largely a tool of the crown. The Star Chamber (q.v.), as it was constituted under Henry VII, was practically identical with the Council, except that the two chief justices were included among its members.

After the Restoration the executive and consultative powers of the Council began to decline. Vain attempts were made by Clarendon and later by Sir William Temple to give it new vigor. Since the reign of William III the cabinet has gradually appropriated all of the political functions of the larger body of which it is legally a part. The Privy Council has ceased to advise the crown regarding the government of the realm.

Since 1870 a privy councilor may be either a native or a naturalized subject of Great Britain. The honor is conferred by the sovereign's nomination, without any patent or grant, and is completed by taking the oath of office. Among the large number of members of the Council are now included the princes of the royal family, the two archbishops, the Bishop of London, the judges of the House of Lords, the Judicial Committee, and the Court of Appeals, all the cabinet ministers of the home government, and the premiers of the self-governing colonies. The office of Privy Councilor formerly fell by the demise of the crown; but by an Act of 1708 the Council continues to exist for six months longer unless sooner determined by the successor. Immediately on the decease of the sovereign the Council assembles and proclaims his successor, the Lord Chancellor affixing the great seal to the proclamation. The body is styled collectively "His Majesty's most honorable Privy Council." The councilors are entitled to the designation "right honorable" prefixed to their names, and they take precedence next after Knights of the Garter. A council can be held only under the presidency of the sovereign. Every other assembly of the members, though they should all attend, is merely a "committee."

The functions of the Council as a whole have become altogether ceremonial, requiring the presence of only three members, and they following the direction of some member of the cabinet. Its real work is now done by committees, and legally the cabinet (q.v.) is but a committee of the Privy Council. Other standing committees are the Judicial Committee, the Board of Trade, the Local Government Board, the Educational Committee, the Agricultural Committee, and the Committee for the Consideration of Charters of Incorporation under the Municipal Corporation Act of 1882.

Ireland has a Privy Council of her own, but the Privy Council of Scotland was merged in that of England in 1708.

Judicial Committee. A high tribunal, created by the Act of 3 and 4 Wm. IV, c. 41, in 1833. It has jurisdiction over appeals from ecclesiastical courts, from the colonies, from the Channel Islands and the Isle of Man, and from such English courts in foreign countries as are maintained there in conformity with treaty stipulations. The members of the committee are the judicial members of the House of Lords together with a few colonial judges. When it is considered that appeals from the highest courts of the colonies may involve important constitutional questions as to the powers and limitations of their legislative bodies, matters which to an important extent determine the very nature of the Empire itself, the dignity and importance of this Judicial Committee will be appreciated.

The forms of a secret council or committee have always been observed by the Judicial Committee, and no publication is made of the views or vote of any member. The judgments or decisions of the committee are transmitted to the sovereign in the form of advice, but that advice is almost invariably followed.

Educational Committee. The committee on Education was established in 1839 by an Order in Council for the purpose of promoting educational legislation and administering moneys voted by the Commons for school buildings and teachers' training colleges. The funds thus voted were turned over by the committee to two societies for the encouragement of elementary education among the poor, and provision was made for the inspection of schools by crown officers. The encouragement of pupil teachers by scholarships in training colleges and the offer of salaries, made possible by the grants of 1846, and the administration of special funds for the increase in the salaries of trained teachers, also devolved upon this committee. The importance of the committee was greatly increased when in 1862 the distribution of moneys in aid of schools was made dependent on the character of their work. The committee of the Privy Council has charge mainly of the disposition of government grants for public elementary education, the curricula, and the certification of teachers engaged in subsidized schools. The Act of 1870 has increased its importance by investing it with the additional power of appointing school boards in cases where existing boards neglect their duties. In 1900 the Education Department, including the Department of Science and Art, was placed under the Board of Education for England and Wales, consisting of the Lord President of the Council, the principal Secretaries of State, and the Chancellor of the Exchequer.

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PRIVY PURSE, KEEPER OF THE. An officer of the royal household in Great Britain, charged with the payment of the private expenses and charities of the sovereign.

PRIVY SEAL. A seal of the British government, which formerly was affixed to documents that were afterward to be authenticated by the great seal, or that were of such minor importance as not to require the great seal. The officer who has custody of the privy seal is called the Lord Privy Seal. As early as the reign of Edward III he was a member of the King's Council and a responsible minister of the crown. The affixing of the privy seal was for centuries by the authority of the Lord Chancellor. Until the reign of Victoria all letters patent, patents of inventions, charters, naturalizations, pensions, creations of honors, pardons, and so on, were required to pass from the signet office to the privy-seal office, the signet seal being the warrant for the privy seal, as the latter was for the great seal. By the Great Seal Act, 1884 (47 and 48 Vict., c. 30, § 3), it was provided that all instruments required to pass the great seal need only have a warrant under the sign manual, countersigned by the Lord Chancellor, Secretary of State, or a high official of the Treasury, and that thereafter no instrument need be passed under the privy seal. The Lord Privy Seal still ranks as fifth great officer of state, usually with a seat in the cabinet, but there is no salary, and no definite functions are now attached to the office. A peer above the rank of a baron is usually appointed, but a commoner is eligible. See GREAT SEAL.

PRIX DE PARIS, GRAND. See GRAND PRIX DE PARIS.

PRIX DE ROME, prē de rōm (Fr., prize of Rome). The Grand Prix de Rome is a prize given by the French government to a certain number of painters, sculptors, architects, musicians, and engravers who have passed a rigid examination in their respective departments of art. The winner of the Prix has four years at the Villa Medici, the Académie de France à Rome, and the annual sum of about 4000 francs for his expenses; he is also exempt from military service. The competition for the Prix is open to any Frenchman, between the ages of 15 and 30, who has fulfilled certain conditions in the Ecole des Beaux-Arts (q.v.) or elsewhere. A scheduled length of time is allowed the student in which to make drawings or models of a given subject for the completed design, and 10 pupils from each section are selected to enter the final competition. They have three months in which to prepare their work. The awards are made every year to painters, sculptors, musicians, and architects, every two years to line engravers, and every three years to engravers on fine stones and medalists. The Académie des Beaux-Arts, a section of the French Institute, has charge of the school at Rome and the "concours" for the Grand Prix. The director of the Academy at Rome is always a French painter chosen from among the members of the Académie des Beaux-Arts. A series of "envois," or specimens of work, are sent each year from Rome to the Salon, to show the pupils' progress. In the case of a musician the envoi goes to the Conservatory, which possesses autographs of all the prize cantatas since the establishment of the Prix.

The Prix de Rome was founded by Louis XIV in 1666. Its purpose was to educate promising young painters and sculptors, at the cost of the state, by study of the antique in Rome. The first director of the school was Charles Errard (q.v.). In 1720 architects were also allowed to compete for the Prix. During the Revolution the school was inactive, but Napoleon enlarged it, and after 1803 musicians, medalists, line engravers, and engravers of precious stones were added to the list of "pensionnaires." At this date also the school was removed to the Villa Medici, the present site of the Académie de France à Rome. Consult Baltard, *La Villa Médicis à Rome* (Paris, 1847).

PRIZE (OF., Fr. *prise*, fem. sing. of *pris*, p.p. of *prendre*, from Lat. *prendere, prehendere,* to seize, take). In international law, a term applied to all captures of property made during the course of war upon the high seas or in the territorial waters of a belligerent. The right to capture both the public property of an enemy on the sea and even the private property of his subjects is recognized by the rules of international law, although the right to capture private property on land has been generally abandoned. The capture of enemy's property cannot be lawfully made in neutral waters, and prizes thus taken must be restored to their owners with such reparation as the neutral government may demand for the violation of its neutrality. Without authority the act of capture must be regarded as piracy and punishable as such. Since the authority to capture enemy's property is derived from the belligerent government, it follows that the title of the captor to the prize which he has taken is subject to the disposition of his government according to law. The government may therefore vest the title in the captor, or it may appropriate the prize to its own use, or destroy it, or sell it, distributing the proceeds among the captors in such manner as the laws of the state may prescribe.

A question of some importance in the law of prizes is the determination of the exact date when the title passes from the original owner to the captor. The right of the captor to that which undoubtedly belongs to his enemy is complete as between him and his enemy so soon as the capture is complete; but as between him and a neutral state which may lay claim to a whole or part of the prize, further evidence of the lawfulness of the capture must be forthcoming. According to one view, the title passes at the moment at which the capture is definitely effected and all resistance has ceased, as is evidenced by striking the flag or voluntarily surrendering. Others claim that the title vests in the captor after 24 hours of secure possession. Still others insist that the capture is complete only when the prize has been carried *infra præsidia* and is thus secure against the possibility of recapture. Whatever may be the correct rule, it would seem that the government to which the captor belongs has an inchoate title at least from the moment the act of seizure has been accomplished. This title may be contested by a neutral government on the ground that the capture was made in its waters or by its subjects, or for other reasons. The inchoate title, therefore, is made complete by having the prize sent into a port of the captor and the question of the lawfulness of the capture authoritatively determined by a judicial tribunal. (See PRIZE COURT.) To this end it is the first duty of the captor to bring in his prize for adjudication if it is capable of making the voyage, otherwise he should destroy it as enemy's property if there be no doubt as to its character, or sell it and turn over the proceeds to the jurisdiction of the proper court for distribution. Formerly the usages of war permitted the captor to take his prize into a neutral port, but neutrals may forbid the use of their ports for this purpose if they see fit, and this is almost the invariable practice except in case of distress or other emergency, and then only for as short a time as circumstances will allow.

A prize intended to be sent into port for adjudication is put in charge of a prize master who is aided by a prize crew. They are charged with taking care that the vessel is not despoiled or damaged and that it is duly delivered to the custody of the court with the ship's papers, register, etc. In order to avoid depletion of the fighting strength resulting from the necessity of supplying prize crews where a number of captures are made, or where for other reasons it may be inconvenient to send a prize into port, it is frequently provided by municipal law and is recognized by the law of nations that a captor may destroy his prize, subject, of course, to the liability of the captor's government for any loss or injury occasioned to neutrals thereby. The right of the captor to accept a ransom for his prize is also recognized. This is an arrangement between the captor and the master of the captured vessel by which the vessel is allowed to continue its voyage upon the promise of the master to pay a specified sum to the captor. The ransom contract serves as a safe-conduct for the vessel during the remainder of the voyage and is a guarantee against capture by another vessel of the captor's government or that of his ally, but not against the perils of the sea. Ransom contracts are valid instruments under international law, and it is customary to allow either party to bring suit on it in the courts of the other. As a means of encouraging the capture of an enemy's vessels, the laws of many states provide for the offering of special rewards to those taking part in operations leading to the capture of vessels belonging to an enemy. Such is the prize money heretofore allowed by the government of the United States, which consisted of the proceeds of the sale of captured vessels and cargoes lawfully captured and regularly condemned, and distributed among officers and crew. This provision for prize money, which had been a law of the United States from the establishment of the government, was abolished by an Act of March 3, 1899. By this act all laws authorizing the distribution of prize money as well as for the payment of bounties and head money were repealed. Consult Thomas Barclay, *Law and Usage of War* (Boston, 1914), and Huberich and King, *Prize Code of the German Empire as in Force July, 1915* (New York, 1915). See ADMIRALTY LAW; CONTRABAND OF WAR; COURT, *English and American*, I, 4 (*f*); DECLARATION OF PARIS; PRIVATEERING; PRIZE COURT; RECAPTURE; WAR.

PRIZE COURT. A special tribunal for the adjudication of questions of prize (q.v.). The submission of the question of the legality of a capture in war to the determination of a court is not a right which an enemy may claim, since it is assumed that all captures are enemy's property. But the fact that frequently property captured is claimed to be owned by neutrals makes a judicial inquiry in such cases necessary in order to determine the responsibility of a belligerent to neutrals. As the determination of questions of this character involves the exercise of admiralty jurisdiction, it is customary to confer jurisdiction in cases of maritime capture upon the admiralty courts. In Great Britain this is done by special commission; in the United States it is a regular branch of the admiralty jurisdiction, which is exercised in the first instance by the district courts. Prize courts differ from other municipal courts in that jurisdiction over the property of a foreigner is acquired, not by his consent expressed or implied, but by force. A prize court usually sits within the territorial jurisdiction of the belligerent under whose authority the capture is made, although it may sit within the territory of an ally. It may not, however, sit in the territory of a neutral even with the consent of the latter. The question to be decided by the court is whether, according to the law of nations, the ship and cargo in question were liable to capture, and if so whether the capture was lawfully made. If the decision be in the affirmative, the prize is pronounced good, is then sold, and the proceeds placed in the hands of an officer of the government for distribution among the officers and men who made the capture, according to the provisions of the law governing captures. If the decision be in the negative, the vessel is restored to its owners. If in the latter case it has suffered damage from the hands of the captors, the government of which the captors are subjects is held responsible only for failure to use reasonable care and skill.

PRIZE FIGHTING. In law, fighting with the fists, either with or without gloves, in public, and for a reward or prize. It is sometimes said that there must be an intention to fight "to a finish" in order to constitute a prize fight, but the practice of fixing a limited number of rounds, in order ostensibly to make a fight a sparring exhibition, has necessitated the adoption of a different rule. The question of the intention of the parties and the promoters of the fight is important. If the intention is that one of the contestants shall "knock out" the other or disable him, and the fight is a public exhibition for money or a prize, it will be considered a prize fight. The manner of distribution of the prize money between the contestants is immaterial. A prize fight differs from a sparring match in that the latter is not held for a prize and there is no intention on the part of the contestants to do each other bodily harm. With very few exceptions, the American States define and prohibit prize fighting by statute. See Boxing.

PRJEVALSKY, przhȧ-väl′skē, Nikolai. See Przhevalski.

PRO′A. See Catamaran.

PROB′ABILISM (from Lat. *probabilis*, probable, from *probare*, to test, examine, from *probus*, good, Skt. *prabhu*, preëminent, from *pra*, before + *bhū*, to be). In theology and philosophy the doctrine that "probable opinions" may be used as a guide to conduct. (See Casuistry.) The word came prominently into discussion in the seventeenth century.

The doctrine of probabilism arose in the Middle Ages from the wide play given in penitential books to the idea of the morally indifferent and was further promoted by the discussions of the scholastics upon conflict of authorities, and thus upon apparent or real conflict of duties, in the moral sphere. Vasquez introduced (1598) probabilism into the moral theology of the Jesuits, and it soon gained a large place, being developed with great subtlety.

The great modern master on the subject is St. Alfonso Liguori (q.v.). He was at first a probabiliorist, later he upheld probabilism, then æquiprobabilism. It is reported that towards the end he declared more than once that he was *not* a probabilist.

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PROB′ABIL′IORISM. See Casuistry.

PROB′ABIL′ITY (Lat. *probabilitas*, from *probabilis*, probable). Expressions like the following are in common use: "It will probably rain to-day," "The chance of finding the article is very small," "He is more likely to succeed than to fail," "A is almost sure to be elected." These expressions all imply a lack of knowledge, an uncertainty as to the actual condition of affairs. But they signify different degrees of uncertainty. The first and third are indefinite, the second and fourth are quite definite. In order to answer in mathematical terms the question, "What is the chance of an event happening?" it is necessary to have some standard of measure or of comparison. Suppose we know only one of 10 candidates on examination for a degree and hear that one passed. What is the chance or probability that our acquaintance is that one? If, according to our knowledge of the case, one candidate is as likely to pass as any other, we may say that the chance of our acquaintance having passed is 1 to 10. If, however, only six of the candidates are men, and our acquaintance is a man, and we hear that it is a man who passed, the chance is now 1 to 6. But if we hear the name of the successful candidate, this name corresponding to that of our acquaintance, and observe that the names on the list are all different, the chance is now 1 to 1, or it is a *certainty*. Certainty is called the *unit of probability*. It is the standard which all estimate alike. All other degrees of probability will be expressed as fractions of certainty. For instance, in the above case of the candidate, on the first evidence the chance is 1:10, on the second evidence it is 1:6, on the third 1, or certainty.

If an event can occur in only one of a number of different ways, equally likely to occur, the probability of its happening at all is the sum of the several probabilities of its happening in the several ways. This proposition, the result of common experience, is generally accepted as axiomatic. Thus, a coin can fall either head or tail, therefore the chance of its falling head is $\frac{1}{2}$ and of its falling tail is $\frac{1}{2}$, the sum of these chances being 1. This is as it should be, for the coin must certainly fall in order to produce head or tail. The probability of an event not happening is found by subtracting from unity the fraction representing the probability that it will happen. For instance, if the chance of an event happening is $\frac{3}{7}$, the chance of its not happening is $1 - \frac{3}{7} = \frac{4}{7}$. Or, if A's chance of hitting a target is $\frac{1}{3}$, his chance of missing is $\frac{2}{3}$; if his chance of hitting is p, his chance of missing is $1 - p$. Two probabilities whose sum is unity are called *complementary* probabilities. For instance, the probability of drawing at one trial a white ball from a bag containing 2 white and 3 black balls is $\frac{2}{5}$. The probability of drawing a black ball is $\frac{3}{5}$. Their sum is 1, hence they are complementary probabilities. In general, if an event can happen in a ways and fail in b ways, all of which are equally likely to occur, the probability of its happening is defined to be $\frac{a}{a+b}$, and the probability of its failing is defined to be $\frac{b}{a+b}$, the two being complementary. In this case the odds in favor of the event are said to be a to b, and the odds against the event are said to be b to a. For instance, there are five ways of drawing one black ball from five black balls and three ways of drawing a white one from three white balls. Hence the probability of drawing a black ball from the whole eight on the first trial is $\frac{5}{8}$, and of not drawing a black ball, or (what is the same thing) of drawing a white one, is $\frac{3}{8}$. The odds in favor of drawing a black ball are 5 to 3; the odds against this are 3 to 5. Likewise, the odds in favor of drawing a white ball are 3 to 5, and the odds against it are 5 to 3.

If the probability of two independent events taking place is respectively $\frac{a}{(a+b)}$ and $\frac{a'}{(a'+b')}$, the probability that both will happen is $\frac{aa'}{(a+b)(a'+b')}$. The probability of both events failing is $\frac{bb'}{(a+b)(a'+b')}$ When *fail* is substituted for *happen*, bb' must be substituted for aa'. Similarly the probability that the first event happens and the second event fails is $\frac{ab'}{(a+b)(a'+b')}$, and the probability that the first event fails and the second event happens is $\frac{a'b}{(a+b)(a'+b')}$. For instance, if p and p' are the respective probabilities that each of two events happens, then pp' is the probability that both happen. In like manner, if there are any number of independent events, the probability that they will all happen is the product of their respective probabilities of happening.

If p represents the probability of the happening of an event in one trial and q the probability of its failing, the probability that it will happen exactly r times in n trials is

$$\frac{n(n-1)\ .\ .\ .\ .\ (n-r+1)}{r!}p^r q^{n-r}.$$

The probability that an event will fail exactly r times in n trials is

$$\frac{n(n-1)\ .\ .\ .\ .\ (n-r+1)}{r!}p^{n-2}q^r.$$

In the expansion of $(p+q)^n$, viz.,

$$p^n + np^{n-1}q + \frac{n(n-1)}{2!}p^{n-2}q^2 + \dots,$$

the terms represent respectively the probabilities of the happening of the event exactly n times, $n-1$ times, $n-2$ times, and so on, in n trials. Hence the most probable number of successes and failures in n trials is given by the greatest term in the corresponding series. For instance, the probability of throwing an ace in one trial with a die is $\frac{1}{6}$ and of failing to do so is $\frac{5}{6}$. Also

$$(\tfrac{1}{6} + \tfrac{5}{6})^4 = \tfrac{1}{1296} + \tfrac{5}{324} + \tfrac{25}{216} + \tfrac{125}{324} + \tfrac{625}{1296};$$

hence the probability of throwing an ace 4 times in 4 throws is $\frac{1}{1296}$, the probability of throwing an ace 3 times in 4 throws is $\frac{5}{324}$, the probability of throwing an ace 2 times in 4 throws is $\frac{25}{216}$, the probability of throwing an ace 1 time in 4 throws is $\frac{125}{324}$, the probability of throwing an ace no time in 4 throws is $\frac{625}{1296}$. Since the last fraction is the largest, the case of no ace in 4 throws of a die is more probable than that of 1, 2, 3, or 4 aces.

A problem in life insurance, a subject to which the theory of probability has been of indispensable service, will serve to show the applications of the subject. A table of mortality gives the numbers alive at each successive year of their age, out of a given number of children born. If l_n and l_{n+1} are the numbers in the table corresponding to the nth and $(n+1)$ the years of age, the inference from the table is that of l_n individuals now alive and of n years of age, l_{n+1} will live one additional year at least. Hence the chance that any one of them die during the year is $\frac{l_n - l_{n+1}}{l_n}$. Calling this $1-p$, p is the chance that any one of them will survive the year. Of two individuals, one n years old, and the other n', what are the chances that (a) only one lives a year? (b) one, at least, lives a year? (c) both do not live a year? Calling the individuals A and B, the chance of A living out the year is p, and the chance of his dying within the year is $1-p$. For B these are p' and $1-p'$. Hence that A lives and B dies the chance is $p(1-p')$. That B lives and A dies the chance is $p'(1-p)$. Hence the answer to (a) is $p+p'-2pp'$. The second case includes, in addition to the conditions of (a), the chance that *both* survive, which is pp'. Hence the answer to (b) is $p+p'-pp'$. In the third case the chance that both live a year is pp'. Hence the chance that both will not live, i.e., that at least one will die, is $1-pp'$. See INSURANCE, *Degree of Probability.*

The theory of probability also furnishes a measure of expectation. The law of expectation in its simplest form may be stated thus: The value of a contingent gain is the product of the sum to be gained into the chance of winning it. Suppose A, B, and C have made a pool, each subscribing $1, and that a game of pure chance (i.e., not dependent on skill) is to be played by them for the $3. What is the value of the expectation of each? By the conditions all are equally likely to win the pool, hence its contingent value must be the same to each; and obviously the sum of these values must represent the whole amount in question. The worth of the expectation of each is therefore $1. That is, if A wishes to retire from the game before it is played out, the fair price which B or C ought to pay him for his share is simply $1. But this is obviously ⅓ of $3, i.e., the value of the pool multiplied by his chance of getting it.

Another very important application of the theory of probability is to the deduction of the *most probable* value from a number of observations, each of which is liable to certain accidental errors. In a set of such observations the probable error is a quantity such that there is the same probability of the true error being greater or less than it, and this probable error has been shown to be least when the sum of the squares of the errors is a minimum. The method for obtaining this least error is called the method of least squares. See LEAST SQUARES, METHOD OF.

The doctrine of probabilities dates as far back as Fermat and Pascal (1654). Huygens (1657) gave the first scientific treatment of the subject, and Jakob Bernoulli's *Ars Conjectandi* (posthumous, 1713) and De Moivre's *Doctrine of Chances* (1718) raised the subject to the plane of a branch of mathematics. The theory of errors may be traced back to Cotes's *Opera Miscellanea* (posthumous, 1722), but a memoir prepared by Simpson in 1755 (printed 1756) first applied the theory to the discussion of errors of observation. Laplace (1774) made the first attempt to deduce a rule for the combination of observations from the principles of the theory of probabilities. He represented the law of probability of errors by a curve $y = \theta(x)$, x being any error and y its probability, and laid down three properties of this curve: (1) it is symmetric as to the Y-axis; (2) the X-axis is an asymptote, the probability of the error ∞ being 0; (3) the area inclosed is 1, it being certain that an error exists. He deduced also a formula for the mean of three observations. Among the contributors to the general theory of probabilities in the nineteenth century have been, besides Laplace, Lacroix (1816), Littrow (1833), Quetelet (1853), Dedekind (1860), Helmert (1872), and Laurent (1873). On the geometric side the influence of Miller and *The Educational Times* has been marked.

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PRO'BATE COURT (Lat. *probatus*, p.p. of *probare*, to test, examine, from *probus*, good). A court whose original functions consist in the probate of wills and the administration of decedents' estates. In 1857 by Act of Parliament (Court of Probate Act, 20–21 Vict., c. 77) an independent Court of Probate was created. To this were transferred from the ecclesiastical courts (q.v.) all powers and duties in probate matters. By the Judicature Act of 1873 (36–37 Vict., c. 66) it became a part of the Supreme Court of Judicature, under the title of the Probate Division. Besides the judges of this division of the High Court of Justice, there are various registrars, record keepers, and minor officials assigned to the registry districts into which the Kingdom is divided. Each district registrar has power to grant probate of wills or letters of administration upon estates of persons having a fixed abode within the district at the time of death, provided no opposition is made thereto. In case of litigation, however, the proceedings for probate must be taken in the first instance in the proper county court or in the Probate Division of the High Court.

In the United States probate courts have been temporal tribunals from the first. The various Colonies conferred the powers of proving and registering wills, of granting letters of administration, and the like, upon some minor civil tribunal. In many of the States at present probate tribunals are distinct courts, with original and extensive jurisdiction not only over the probate of wills and the administration of decedents' estates, but over the appointment of guardians to minor and other legally incompetent persons, over petitions for the adoption of children and the change of names. In other States these functions are imposed by statute upon different local tribunals, such as district and county courts. Even in States of the former class the tribunals are variously designated, as courts of probate, surrogates' courts, ordinary's courts, or orphans' courts. They are always inferior courts from whose decisions appeals may be taken to higher tribunals. For their jurisdiction and powers, the statutes in each State must be consulted.

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PROBATE DUTIES. See DEATH DUTIES.

PROBA'TION (Lat. *probatio*, from *probare*, to test, examine). In criminal law, a method of exercising judicial supervision over a person who has been convicted of crime without subjecting him to the penalty of imprisonment. As usually employed it is resorted to only in the case of misdemeanants and not of persons guilty of grave offenses and rarely of any but first offenders. In practice a probation officer is usually employed to exercise the needed supervision, the period of which is fixed by the court or sometimes by statute. This method of dealing with certain grades of offenders is growing in favor as a wise and humane modification of the criminal law. See IMPRISONMENT; PUNISHMENT; PAROLE.

PROBATION AFTER DEATH. A theological doctrine according to which man's future destiny is not unalterably fixed at death, but either all men or a certain class of men will be placed on trial in another life for a definite period or until they shall have yielded to God's redeeming love. In one form or another this doctrine has been held by many Jews and Christians since, under the influence of Persian and Greek thought, the idea of future punishment developed among them. (See HELL.) Scriptural support for the doctrine has generally been sought in 1 Peter iii. 19–20, iv. 6, in which a critical exegesis unquestionably is obliged to find the belief expressed that Jesus, after his death, went to Hades to proclaim the gospel to one class of the dead, viz., those who had been disobedient in the days of Noah. While the advocates of future probation have emphasized the necessity of actual knowledge of the life, teachings, death, and resurrection of Jesus, many defenders of the officially recognized system of eschatology have regarded such knowledge as of less importance than the moral and religious disposition that under favorable circumstances may find expression in a free and intelligent acceptance of Christ. Consult: I. A. Dorner, *System der christlichen Glaubenslehre* (Berlin, 1879–81; Eng. trans., Edinburgh, 1880–84); *Dorner on the Future State*, translation of the eschatological section of the preceding work by Newman Smyth (New York, 1883); S. M. Vernon, *Probation and Punishment* (ib., 1890). See ESCHATOLOGY; HEAVEN; HELL; IMMORTALITY; JUDGMENT, FINAL; UNIVERSALISM.

PROB'LEM (OF. *probleme*, Fr. *problème*, from Lat. *problema*, from Gk. πρόβλημα, problem, from προβάλλειν, *proballein*, to place before, from πρό, *pro*, before + βάλλειν, *ballein*, to throw). In geometry, a proposition in which some operation or construction is required; e.g., the proposition "To construct an equilateral triangle" would be a problem. This is the common usage of the term at present, but it has not always been such. For the historical view, consult T. L. Heath, *The Thirteen Books of Euclid's Elements,* vol. i (Cambridge, 1908). See Construction.

PROBLEM OF THE THREE BODIES. An astronomical problem demanding the motion of three bodies attracting one another according to the law of gravitation. A complete solution of this problem has so far defied the mathematicians, although the general differential equations of the motion were given by Laplace. See Clairaut.

PRO′BOSCID′EA (Neo-Lat., from Lat. *proboscis,* from Gk. *προβοσκίς, proboskis,* proboscis, from *πρό, pro,* before + *βόσκειν, boskein,* to feed). An order of mammals embracing the elephants (see Elephant), living and extinct. The nearest relatives of the Proboscidea are the extinct Toxodontia on one hand and on the other the Hyracoidea. Consult Beddard, *Mammalia* (London, 1902).

PROBOS′CIS MONKEY, or Nose-Ape. A large, yellowish monkey with the head and long hair of the neck and shoulders chestnut. It is closely allied to the langurs, but is distinguished by having in the adult male a comically long nose, for which reason mainly it has been set apart in a separate genus and given the name *Nasalis larvatus.* This monkey is a native of Borneo, where it goes about in large bands, the habits of which are little known. It seems to be merely an aberrant form of the genus *Semnopithecus.* Consult D. G. Elliot, *A Review of the Primates* (New York, 1913). See Plate of Monkeys of the Old World.

PRO′BUS, Marcus Aurelius. Roman Emperor 276–282 a.d. He was born at Sirmium in Pannonia about 232 a.d. Probus early entered the army, and had the fortune to receive favorable notice from the Emperor, Valerian, who raised him before the legal period to the rank of tribune. He distinguished himself against the Sarmatians on the Danube, and subsequently in Africa, Egypt, Asia, Germany, and Gaul, winning golden opinions from Valerian's successors, Gallienus, Claudius II, Aurelian, and Tacitus. By the last-named Emperor he was appointed governor of the whole of Rome's Asiatic possessions. Such was the zealous attachment evinced for him by his soldiers, that, on the death of Tacitus, they forced him to assume the purple; and his rival, Florianus, having been removed, Probus was enthusiastically hailed Emperor by all classes (276 a.d.). His brief reign was signalized by important successes. The Germans were driven out of Gaul with enormous slaughter, pursued into the heart of their own country, compelled to restore their plunder and to furnish a contingent to the Roman armies. Probus swept the barbarians from the Rhætian, Pannonian, and Thracian frontiers, and forced Persia to agree to a humiliating peace. On his return to Rome Probus devoted himself to the development of the internal resources of the Empire; but, as the Romans had now no enemies, the Emperor employed the soldiers as laborers in executing various extensive and important works of public utility. Such occupations, considered as degrading by the soldiers, excited the utmost irritation, and a body of them murdered him (October, 282 a.d.). Consult: Champigny, *Les Césars* (Paris, 1843); Hermann Schiller, *Geschichte der römischen Kaizerzeit,* vol. i (Gotha, 1883), and the article "Aurelius, 27," in Friedrich Lübker, *Reallexikon des klassischen Altertums,* vol. i (8th ed., Leipzig, 1914).

PROBUS, Marcus Valerius. A Roman critic and grammarian, born at Berytus in Syria in the second half of the first century a.d. He devoted his attention chiefly to the archaic and classic literature of Rome, and made annotated editions of Horace, Vergil, Lucretius, Terence, and Persius, after the manner of the Alexandrian scholars. His biography of Persius is extant, but the extant commentary to Vergil's *Eclogues* and *Georgics,* and several grammatical treatises bearing his name, are probably the works of a grammarian of the fourth century. Probus is usually ranked among the greatest Roman philologists. Consult: Steub, *De Probis Grammaticis* (Jena, 1871); Henry Nettleship, *Lectures and Essays,* 2d series (Oxford, 1895); W. S. Teuffel, *Geschichte der römischen Literatur,* vol. ii (6th ed., Leipzig, 1910); Martin Schanz, *Geschichte der römischen Litteratur,* vol. ii, part ii (3d ed., Munich, 1913).

PROCE′DURE (OF. *procedure,* Fr. *procédure,* from Lat. *procedere,* to go forward, from *pro,* before, for + *cedere,* to go). In law, the successive steps or proceedings in the initiation and conduct of a judicial proceeding and the rules of law governing them. In its broadest sense the term includes evidence and pleading. In a narrower sense the term is used as synonymous with practice, which embraces the rules governing the form and manner of conducting the various steps in a legal proceeding other than the rules of evidence (q.v.) and the rules of pleading (q.v.).

The judicial proceeding may be directed towards the person, when it is said to be in personam; or it may be directed towards the property, when it is said to be in rem. See In Personam; In Rem; Law.

In English jurisprudence three distinct systems of procedure corresponding and adapted to distinct systems of jurisprudence were developed respectively by the courts of common law, the courts of chancery, and the courts of admiralty.

Common-Law Procedure. The common-law procedure is much older than the procedure in either equity or admiralty as practiced by the English courts, the Curia Regis which was the forerunner of the English courts of Exchequer, Common Pleas, and King's Bench, in which the common-law procedure was developed, having been established during the reign of Henry I (1100–1135). The common-law procedure was early marked by extreme formality and by an increasing complexity, and ultimately it became necessary to simplify the system by means of legislation, which has resulted in the various forms of reformed common-law procedure in modern use in England and in most of the United States. See Code.

The first step in an action at common law was the issuing of the original writ on application of the plaintiff, which commanded the sheriff to summon the defendant to give to the plaintiff the relief demanded by him or to appear before the next term of court and show cause why such relief should not be granted. The effect of the original writ was twofold. It gave the court jurisdiction over the subject matter by authorizing it to proceed with all subsequent steps in the litigation. It also gave the court jurisdiction over the person of the defendant when the sheriff had executed the writ by serving it personally upon him. It could then issue its process or mandate compelling the attendance of the parties and witnesses, direct the filing of pleadings, summon and impanel a jury, and after trial and verdict enter judgment for the successful party and issue its execution or other mandate to the sheriff for the purpose of satisfying the judgment. Historically the original writ is also important, as from it the action took its form, since the plaintiff's pleading was required to conform to the allegations and demand for relief contained in the original writ. See FORMS OF ACTION.

The original writ having been issued and served upon the defendant, it then became his duty to appear in the proceeding and plead, and if necessary the court could compel his appearance by issuance of its process (q.v.) known as a judicial writ as distinguished from the original writ. The method of pleading and of trying the issues raised by the pleadings is fully considered under such titles as EVIDENCE; JURY; PLEADING; TRIAL.

During the course of the proceeding and after verdict the parties to the action might apply to the court for various forms of relief incidental to the proper conduct of the proceeding. Thus, upon application the court might use the subpœna to command the attendance of witnesses and punish for contempt; and after verdict the unsuccessful party might make motions for a direction of the court, in effect reversing or setting aside the verdict of the jury. Thus, the unsuccessful party might move: (*a*) for a new trial on the ground that the judge had not properly instructed the jury or that he had admitted or excluded evidence contrary to law or because of newly discovered evidence; or (*b*) he might move in arrest of judgment on the ground that some error on the face of the record vitiated all the proceedings; or (*c*) if the verdict was for the defendant, the plaintiff might move for judgment *non obstante veredicto*—without regard to the verdict—on the ground that he was entitled to judgment on the face of the pleadings; or (*d*) for a repleader, i.e., allowing the parties to plead anew because they had framed issues upon some immaterial matter; or (*e*) for a *venire facias de novo*, i.e., a judicial writ summoning a new jury because the jury at the trial in the action was guilty of some misconduct invalidating its verdict.

Upon the denial of these motions judgment was entered by the court, usually by signing of the judgment by a proper officer of the court, for the plaintiff (*quod recuperet*) or for the defendant (*nil capiat*) in accordance with the verdict. The successful party was then entitled to enforce the judgment by the writ of execution. (See ATTACHMENT; EXECUTION; JUDGMENT.) If, however, the unsuccessful party deemed the judgment erroneous in law, he was at liberty to remove the entire record of the case to a higher court for review upon suing out a writ of error, which, like the original writ, was issued out of chancery. See ERROR, WRIT OF.

Such in its barest outline was the method of procedure developed by the common-law courts. The material elements of the system, except possibly those of the system of pleading, remain unchanged, although there has been great modification of the minor details, chiefly in the direction of greater simplicity. The first of these changes was in the use of the original writ. By the use of a series of fictions the common-law courts came ultimately to dispense with the original writ as a means of acquiring jurisdiction, and the action was regularly begun by the issuance by the courts of law of their judicial process, the summons directly, instead of the original writ. In each of the United States there are now courts established by statute having general jurisdiction over actions and authorized to acquire jurisdiction over the person of litigants upon service of its summons or writ. The summons is still issued in the name of the court, but usually attorneys as officers of the court are authorized to issue the summons directly without application to the court. This is true also of many other forms of process, as, e.g., subpœnas to appear and testify and the writ of execution.

The various changes in the system of pleading, which are more substantial than any which have taken place in procedure proper, have been noted under that title, but the system of pleading has been indirectly modified by changes in procedure.

Common-law courts also exercised jurisdiction in personam by what were known as the extraordinary writs—certiorari (q.v.), habeas corpus (q.v.), quo warranto (q.v.), and mandamus (q.v.).

For the procedure in criminal actions, see GRAND JURY; INDICTMENT; JURY; PROSECUTION; PROSECUTOR; PUNISHMENT; ETC.

Equity Procedure. Procedure in equity is much simpler than the procedure at common law. Its essential characteristics are based on the fact that the jurisdiction of equity is in personam and that the sole power of that court is to command things to be done and not directly to transfer or otherwise affect the rights of litigants. The first step in a proceeding in equity was to file in the office of the clerk of the court the bill, which is the plaintiff's first pleading. Inasmuch as a court of equity acts in personam only, it can deal adequately with a many-sided controversy. There was consequently no limit to the number of parties to the proceeding, whose interests might be as diverse as their number, provided they were all interested in the controversy, and they might be brought into the proceeding by a proper bill. Upon service of the subpœna the plaintiff then became entitled to an answer, failing which he was entitled upon the default of the defendant to the relief asked by the bill, or he could apply to have an attachment issued compelling the defendant to answer. Upon a determination of the questions raised by the pleadings and at the trial, the court might then make its decree adjusting the rights of all parties and commanding them to carry out its directions. If a party refused to obey the decree or order and was willing to accept the punishment for contempt, the court of equity was powerless to execute its decrees; but in modern practice this contingency is avoided by statutes authorizing the court to appoint an officer of the court to do the act required by the decree to be performed by a party and with the same legal effect. See EQUITY.

At any stage of the proceeding, or even before service of process, the court may grant interlocutory or intermediate relief to prevent injury to the parties or the subject of the suit pending the litigation. This is usually in the form of a temporary injunction (q.v.) or the appointment of a receiver (q.v.). Equity procedure, when it has been maintained as a distinct system, as in the United States courts and in a few States, notably New Jersey, has undergone no substantial change; and when modification has been adopted it has been usually accomplished by rules of court.

Admiralty Procedure. Procedure in admiralty was founded upon the civil law, and corresponds in many particulars to the equity system. It was much more simple and expeditious than the procedure of the common-law courts. It was adapted to proceedings either in rem or in personam, and, indeed, both forms of remedy might be had in a single proceeding.

The first step in an Admiralty proceeding was the filing of the libel, which, like the bill in equity, was both the plaintiff's or libellant's first pleading and a petition to the Admiralty Court to issue its writ or process, which was executed by an officer of the court by personally serving it upon the respondent in case the proceeding was in personam or by taking possession of the property in case the proceeding was in rem. As in equity practice the libellant might compel the defendant to give discovery (see PLEADING) by annexing interrogatories to his libel. If the respondent failed to appear the libel was taken *pro confesso* upon the default, and an appropriate decree was rendered. Upon the appearance of the respondent he might either except to the libel or file his answer. The exception might be peremptory, when it was in substance like a demurrer to the substance of the libel; or it might be dilatory, when it was in effect like a demurrer to the form of the libel or a motion to strike out irrelevant or scandalous matter. The effect of the peremptory exception, if sustained, was the dismissal of the bill; otherwise the respondent was required to answer. In the case of a dilatory exception, if sustained, the libellant was required to correct his libel by amendment so as to make it formally correct, otherwise the respondent was required to answer. The answer might set up any matter of defense or an independent claim against the libellant, when the answer was called a cross libel. No attempt was made to reduce the matter in dispute to a single issue as in the pleadings at common law. As in equity all evidence was usually taken before a commissioner or corresponding officer of the court and then submitted to the court, and as in equity the judgment of the court might be embodied in an interlocutory decree followed by a final decree.

Incidental relief might be granted during the progress of the litigation upon petition, if the application was *ex parte*, or by motion, when notice was given to the other litigants. Thus, the court might authorize the sale of perishable goods and the appropriation of the proceeds as directed by the final decree, or it might authorize the return of property from the litigation upon the filing of a proper bond.

Admiralty procedure has undergone but slight modification, and that, as in equity, has been effected for the most part by rules of court.

Codes of Procedure. The embarrassment experienced as a consequence of the technical character of the common-law procedure led to various attempts at reform by legislation. The earliest of these was directed towards a simplification of the system of pleading, and has been referred to under that title. In 1848 the Legislature of New York adopted a civil code which was intended to be a complete codification of procedure both in law and in equity. The New York code served as a model for similar legislation in many other States, while most of the remaining States, though nominally not code States, have so far revised their systems of procedure as to have systems substantially like the codes of procedure. Owing to the inherent difficulties in acceptably codifying a system so complex as the law of procedure, the codes have required frequent amendment and revision, despite which they are still found to have perpetuated many of the faults of the common-law system.

The following are some of the more important changes effected both by the codes and the various statutes enacted for the purpose of reforming procedure. All formal distinctions between the procedure at law and in equity have been abolished, and while the methods of trial in the one case by a jury and in the other by the court have been preserved, the same court sits both as a court of law and a court of equity. Interlocutory or provisional remedies have been created by which in certain cases the plaintiff is enabled to procure a preliminary writ of attachment directed against the property or person of the defendant pending the litigation. Provision is also made for various motions to correct or amend the pleadings and for examination of witnesses and parties before trial; and the law relating to injunction and receivers is frequently regulated wholly by statute. Various provisions are also made to aid in the enforcement of judgments, usually by way of supplementary proceedings for examination of the judgment debtor and the appointment of receivers to collect sums due to him and apply them in satisfaction of the judgment.

Bibliography. A. D. Elliot, *Criminal Procedure in England and Scotland* (London, 1878); E. D. Daniell, *Pleading and Practice of the High Court of Chancery* (6th Amer. ed., Boston, 1894); J. P. Bishop, *New Criminal Procedure* (4th ed., 2 vols., ib., 1895–96); O. P. Shiras, *Equity Practice in the United States Circuit Courts* (2d ed., Chicago, 1898); *Code of Criminal Procedure of the State of New York*, twelfth edition by A. J. Parker (New York, 1912); Adhémar Esmein, *A History of Continental Criminal Procedure, with Special Reference to France*, English translation by John Simpson (Boston, 1913); J. P. Bishop, *New Criminal Procedure* (2d ed., 3 vols., Chicago, 1913); John Lewson, *Pleading, Practice, and Forms at Common Law* (3 vols., ib., 1914); J. W. Donovan, *Skill in Trials* (2d ed., Rochester, N. Y., 1915); and the works referred to under ADMIRALTY LAW; CODE; COMMON LAW; EQUITY; PLEADING; ETC.

PROCEEDINGS, LEGAL. See LEGAL PROCEEDINGS.

PROCEEDINGS, SUMMARY. See SUMMARY PROCEEDINGS.

PROCEEDINGS, SUPPLEMENTARY. See SUPPLEMENTARY PROCEEDINGS.

PROCESS, prŏs′ĕs *or* prō′sĕs (OF. *proces*, Fr. *procès*, from Lat. *processus*, a going forward, from *procedere*, to go forward). In law, a comprehensive term, including all mandates of a court, in either civil or criminal actions or proceedings, whether directed to an officer thereof or to an individual. The term is also sometimes rather loosely employed to designate all the proceedings in an action or legal proceeding, and it is in this sense that it is used in the familiar phrase "due process of law." However, the word "procedure" is a much better term for that purpose, as it includes many steps in an action which could not strictly be termed process, e.g., the argument of a case. Process is usually issued in the name of and under the seal of a court by an officer thereof, but in some States where code practice prevails certain processes, such as civil summons and subpœnas, may be issued in the name of the proper court by an attorney in his capacity as an officer of the court. Under the common-law practice original process was the original writ by which the action was commenced, and mesne process (q.v.) was that which was issued afterward and during the progress of the action. Disobedience of process is contempt (q.v.) of court. See Action; Procedure; Summons; Subpœna.

In patent law a process is a mode or manner of accomplishing a particular result by the application or combination of elements or natural forces. See Due Process of Law; Patent.

PROCES′SIONAL (ML. *processionale*, from Lat. *processio*, procession, from *procedere*, to go forward). The service book which contains the prayers, hymns, and general ceremonial of the different processions in the Roman Catholic church. Many forms of the ritual for this part of the service exist, but the processional approved for common use is that of Rome, of which many editions have been published.

PROCESSION OF THE HOLY GHOST. A theological term used to describe the origin or proceeding of the third person of the blessed Trinity. In the early Church controversies were concerned chiefly with the second person, and the question as to the origin of the Holy Spirit was not raised. In the form of the Niceno-Constantinopolitan creed used by the Greek church it is said simply that the Holy Ghost "proceedeth from the Father." This was understood in the Latin church to mean that, as the Son proceeds from the Father, so the Holy Ghost proceeds from both the Father and the Son, and in the course of time the words "and from the Son" (*filioque*) were added in the churches of the West. This furnished the occasion for the formal separation of Eastern and Western Christianity, and has always been one of the chief contentions between the Latin and Greek churches. See Creeds and Confessions; Filioque; Greek Church.

PROCHEIN AMI, prṓ-shăn′ ȧ-mē′. The old Norman-French law phrase for "next friend." See Next Friend.

PROCHLO′RITE. A prominent mineral in the group of chlorites (q.v.), containing iron, magnesium, and aluminium. It is monoclinic in crystallization, but the crystals are small and distorted, the massive foliated and granular varieties being more common. The color varies from grass green to blackish green and the lustre from feebly pearly to dull. Prochlorite is frequently found in chloritic and talcose rocks and in serpentine.

PROCIDA, prō′chē̇-dȧ. A small island off the west coast of Italy, situated between the island of Ischia and the mainland, north of the entrance to the Bay of Naples (Map: Italy, D 4). It is about 1 mile wide and 2 miles long, and of volcanic origin, but low and flat. Two semicircular bays on the south coast are the remains of submerged craters. The island is fertile and populous, having in 1911 a population of 14,440, engaged in vine and fruit culture and tunny fishery. The town of Procida on the east coast lies at the foot of a precipitous rock crowned by a castle. Its population is 4603.

PROCIDA, John of. A tragedy by James Sheridan Knowles (1840).

PROCLAMATION OF EMANCIPATION. See Emancipation, Proclamation of.

PRO′CLUS, or **PROC′ULUS** (Lat., from Gk. Πρόκλος, *Proklos*) (410–485 A.D.). The last important teacher among the Greek Neoplatonists. (See Neoplatonism.) He was born at Constantinople, brought up at Xanthus in Lycia, and first trained in philosophy at Alexandria by the Aristotelian Olympiodorus. In Athens he was a disciple of the Neoplatonists Plutarch and Syrianus, and about 450 he succeeded the latter in the chair of philosophy. Hence he received the name Diadochos (the successor); others think of him as successor to Plato. He is said to have had the greatest influence among his contemporaries because of his learning and piety. He is sometimes known as "the Scholastic among Greek philosophers," because he labored to collate, arrange, and reduce to a rigidly scientific system the mass of older philosophy which had come down to him. His teaching was a development of that of his master, Plotinus (q.v.), but is still more mystical and difficult to understand, combining the most transcendental speculation with the common superstitions of his age. Certain features remind us strongly of Gnosticism, and his teaching on evil seems to have been the source of the doctrine of Dionysius the Areopagite. Among his works, of which there is as yet no complete edition, the most important are his commentaries to certain of Plato's dialogues and also his work on *Platonic Theology*. His *Philosophical and Theological Institutions* in 211 chapters is a compendium of the principles of Neoplatonism. Important are his treatises on *Providence and Fate, Doubts about Providence, the Nature of Evil*, etc. His work in 18 books against the Christians, mentioned by Suidas, has been lost. He also produced certain encyclopædic works, including a commentary on Hesiod, Euclid, and Ptolemy and a book *On the Sphere*. Certain hymns by him have also been preserved. Some of these writings are known to us only in translation. Among the partial editions of his works may be named: *Procli Opera*, edited by Cousin (6 vols., Paris, 1820–27; 2d ed., 1864); a commentary on Plato's *Parmenides*, edited by Stallbaum (Leipzig, 1839, 1848); on Plato's *Timæus*, edited by Schneider (Breslau, 1847); on Plato's *Republic*, edited by Schöll (Berlin, 1886), edited by Kroll (2 vols., Leipzig, 1899–1901). There are English translations of the *Philosophical and Mathematical Commentaries*, by Taylor (2 vols., London, 1792); of the *Platonic Theology* and minor philosophical and theological treatises by the same (2 vols., ib., 1816); and of the *Commentary on the Timæus* (2 vols., ib., 1820). Consult: Eduard Zeller, *Philosophie der Griechen* (3d ed., Leipzig, 1881); J. E. Sandys, *A History of Classical Scholarship*, vol. i (2d ed., Cambridge, 1906); T. Whittaker, *The Neo-Platonists* (ib., 1901); Christ-Schmid, *Geschichte der griechischen Litteratur*, vol. ii, part ii (5th ed., Munich, 1913).

PROCNE, prŏk′nē̇ (Lat., from Gk. Πρόκνη, *Proknē*). In Greek legend, the wife of Tereus and the sister of Philomela (q.v.).

PROCONSUL (Lat., deputy consul). Originally a Roman magistrate not holding the consulship, who was invested with powers nearly approaching those of a consul (q.v.), not, however, including Rome and its immediate vicinity. In early times the proconsul was an ex-consul who, on completing his term of office, received a continuation of the *imperium* in order to enable him to bring an unfinished campaign to a close. The duration of the office was one year. In the later period, when conquests had added foreign provinces to the Roman rule, the consuls, on giving up their position, received, as proconsuls, either the conduct of a war or the administration of a province. Occasionally the office of proconsul, with the government of a province, was conferred on a person who had never held the consulship. In the reorganization of the Roman Empire the administration of the provinces was divided between the Emperor and the senate, and the title "proconsul" was confined to the governors of senatorial provinces. Under Constantine parts of certain dioceses came to be governed by proconsuls.

PROCOPE, prō̇′kō̇p′, Café. The first and most famous of Parisian cafés, situated opposite the Comédie Française when that theatre was opened in 1689, and still existing. Among its frequenters were Voltaire, Rousseau, Robespierre, Gambetta, and other famous men. A journal, *Le Procope*, published by the proprietor of the café, was founded in the seventeenth century to record the history of the café and its frequenters.

PROCO′PIUS (Lat., from Gk. Προκόπιος, *Prokopios*). The best known of the 16 Byzantine historians. He was born at Cæsarea in Palestine about 500 A.D., went to Constantinople when still a young man, and acquired there so high a reputation as a professor of rhetoric that Belisarius (q.v.) appointed him his private secretary (527). Procopius accompanied the great warrior in all his important campaigns in Asia, Africa, and Italy, and appears to have displayed remarkable practical as well as literary talent, for we find him placed at the head both of the commissariat department and of the Byzantine navy. He returned to Constantinople shortly before 542, and was highly honored by Justinian; some scholars identify him with the Procopius who is known to have been appointed prefect of the metropolis in 562. His death occurred, it is thought, about three years later. Procopius' principal works (all in Greek) are his *Historiæ*, in eight books (two on the Persian wars, from 408 to 553; two on the wars with the Vandals, from 395 to 545; four on the Gothic wars, going down to 553); *Ctismata*, or six books on the buildings erected or restored by Justinian; and *Anecdota*, or *Historia Arcana* (which some have been unwilling to attribute to Procopius), a sort of *Chronique scandaleuse* of the court of Justinian, most of whose piquant passages were transferred by Gibbon to the footnotes of his *Decline and Fall of the Roman Empire*. They remained one of the French memoirs of the court under the old régime. The most valuable of his productions is the first. Procopius is the principal authority for the reign of Justinian. His style is pure, vigorous, and flexible. The best complete edition of his works is that by J. Hawry (3 vols., Leipzig, 1905). There is an early English translation of the *Historiæ* by H. Holcroft (London, 1653), and one of the *Ctismata* by A. Stewart (ib., 1888). The section on the Gothic wars has been edited with an Italian translation by Comparetti (3 vols., Rome, 1895–98). Consult: Marrast, *Esquisses Byzantines* (Paris, 1874); Hernerden, *Ad Procopium* (Leipzig, 1906); J. E. Sandys, *A History of Classical Scholarship*, vol. i (2d ed., ib., 1906); H. T. Peck, *A History of Classical Philology* (New York, 1911); Christ-Schmid, *Geschichte der griechischen Litteratur*, vol. ii, part ii (5th ed., Munich, 1913).

PROCOPIUS, or **PROKOP**, Andrew (c.1380–1434). A Hussite leader, known as Procopius the Great. He is also sometimes called the Holy, or the Shaven, in allusion to his having received the tonsure in early life. He studied in Prague, and after traveling for several years in foreign countries he returned to Bohemia and entered the ranks of the insurgent Hussites. His military genius soon raised him to the rank of an influential commander, although he did not fight in the battle which he directed. On the death of Ziska (q.v.), in 1424, Procopius was elected by the Taborites, who formed the radical section of the Hussites, as their leader. In the ensuing years he ravaged Austria, and in 1426 vanquished the crusading armies of central Germany at Aussig. In the meanwhile another body of Taborites, who called themselves Orphans, had overrun Lusatia and burned Lauban, under the leadership of Procopius the Lesser, or Younger, who now, in concert with the more distinguished Procopius, attacked Silesia and took part in those internal feuds of the Hussite factions by which Bohemia was almost wholly ruined. From 1428 to 1430 Procopius directed raids against Hungary, Silesia, Saxony, Franconia, and other neighboring lands, which were successful and caused the Hussites to be dreaded. The Emperor Sigismund attempted to treat with him, but was unsuccessful, and in 1431 Procopius decisively defeated a German army at Tauss. In 1433 the moderate Hussites, or Calixtines, accepted the terms offered by the Catholic party. The Taborites and Orphans, under the leadership of Procopius the Great and Procopius the Lesser, refused, however, to have anything to do with the Pope, and hence dissensions arose between them and the more moderate of the Hussites. After many lesser encounters between these factions, a decisive battle was fought near Böhmisch-Brod on May 30, 1434, in which both Procopius the Great and Procopius the Lesser were slain. Consult Mandell Creighton, *History of the Papacy*, vol. ii (London, 1902). See Hussites.

PRO′CRIS. See Cephalus.

PROCRUSTES, prō̇-krŭs′tēz (Lat., from Gk. Προκρούστης, *Prokroustēs*, the stretcher, from προκρούειν, *prokrouein*, to beat out, stretch). The surname of a celebrated Greek robber who lived near Eleusis in Attica, named Damastes, or Polypemon. According to the ancient legend he had two beds, one short, the other long. If a short traveler came to him, he placed him on the long bed and hammered or stretched him out to fit; tall visitors he placed on the short bed and cut down to the proper length. Other writers speak of but one bed. On his journey from Troezen to Attica Theseus killed Procrustes in the same way the latter had slain his victims. Consult Plutarch, *Theseus*, 11.

PROC'TER, ADELAIDE ANNE (1825–64). An English poet, the eldest daughter of Bryan Waller Procter. She was born in London. In 1853 she became a contributor of verses to *Household Words*, under the nom de plume of Mary Berwick, and attracted the attention of Charles Dickens, who did much in the way of introducing her contributions to the public. In 1858 her collected poems were published in two volumes under the title of *Legends and Lyrics: A Book of Verse*. A number of editions were subsequently published, new verses being supplied to several of them, and for the edition of 1866, the tenth, Charles Dickens supplied a memoir. Far from being a great poet, she still expressed herself with sincerity and charm. Her verses include several hymns that have retained their popularity. She was a cousin of Archbishop E. W. Benson (q.v.).

PROCTER, BRYAN WALLER (1787–1874). An English poet, better known as BARRY CORNWALL. He was born at Leeds and was educated at Harrow, where he met Peel and Byron. He settled in London, where he was called to the bar and practiced as conveyancer. Shortly after the death of his father (1816) Procter joined the circle of Leigh Hunt and Charles Lamb and married (1824) a stepdaughter of Basil Montagu. He was commissioner in lunacy from 1832 to 1861. Procter's principal publications were: *Dramatic Scenes and Other Poems* (1819); *Marcian Colonna and Other Poems* (1820); *A Sicilian Story and Other Poems* (1820); *Mirandola*, a tragedy (1821); *The Flood of Thessaly* (1823); *English Songs* (1832). To the last half of his life belongs his delightful *Charles Lamb*, a memoir (1866–68). His *Essays and Tales in Prose* were collected in 1853. Procter wrote nearly 300 songs on a wide range of theme. It may fairly be said that he restored to the English lyric the melody that it had among the Elizabethans. Consult Coventry Patmore, *Life of B. W. Procter* (London, 1877), containing the fragment of an autobiography, and E. T. Mason, in *Personal Traits of British Authors*, vol. iii (Boston, 1885).

PROC'TOR. A town and village in Rutland Co., Vt., 6 miles north of Rutland, on the Clarendon and Pittsford and the Rutland railroads (Map: Vermont, A 5). It has a hospital and a public library. The quarrying and finishing of marble are the chief industries. Pop. (town), 1900, 2136; 1910, 2871.

PROCTOR (abbrev. from OF. *procurator*, from Lat. *procurator*, manager, from *procurare*, to manage, from *pro*, before, for + *curare*, to care, from *cura*, care). In its legal sense, originally one of the body of men who had the exclusive privilege of appearing in the ecclesiastical and admiralty courts of England; now any attorney who practices in either of these courts or in a probate court. The former proctors were admitted to practice only by a commission issued in the name of the Archbishop of Canterbury. A proctor might have an advocate do the actual pleading or trial work for him, but he alone could bring and conduct the proceedings in his own name.

On the transfer of the jurisdiction of the ecclesiastical courts over the probate of wills, the administration of estates, and matrimonial causes, to the probate and divorce divisions, the proctors practicing in the former courts were empowered to appear in all the courts of equity and common law in England. In 1877 the Solicitors Act provided that all solicitors should have power to practice as proctors on their admission without further examination. Upon the abolition of the old judicial system of England by the Judicature Acts (q.v.), the authority to practice in both the new courts was given to both proctors and solicitors. Therefore, in England to-day, the old legal distinction between proctors and other members of the bar has been abolished.

However, in both England and, to some extent, the United States the title "proctor" is still applied to practitioners in the surrogates, probate, and admiralty courts, merely as a matter of description and without any special legal signification. See ATTORNEY; LAWYER; SOLICITOR.

By other uses of the term in England it is applied to the representatives of the parochial clergy in convocation (q.v.) and to officers charged with the maintenance of discipline among undergraduates in Oxford, Cambridge, and other universities.

PROCTOR, A(LEXANDER) PHIMISTER (1862–). An American sculptor and painter. He was born at Bozanquit, Ontario, but early removed to the United States. As a boy he began to sketch wild animals in the Rocky Mountains. Later he studied at the National Academy of Design and the Art Students' League, New York, and in Paris under Puech and Injalbert. His studies of animals, which first attracted attention at the Chicago World's Fair, are novel, personal, and powerful. Among his best-known statues and groups are the quadriga for the United States pavilion at the Paris Exposition (1900); the "Panthers" (Prospect Park, Brooklyn); the "Lions" (McKinley Monument, Buffalo); and the statuettes "Puma," "Dog with Bone," "Fawn," and "Fate" (Metropolitan Museum, New York). Proctor received gold medals at Paris (1900), St. Louis (1904), and San Francisco (1915), and was elected a National Academician in 1904.

PROCTOR, REDFIELD (1831–1908). An American political leader and cabinet officer. He was born in Proctorsville, Vt., and graduated at Dartmouth College in 1851 and from the Albany Law School in 1859. He served throughout the Civil War, rising from a lieutenancy in the Third Vermont Volunteer Infantry to be colonel of the Fifteenth Vermont, taking part in the battle of Gettysburg. After some practice of law he devoted himself to his extensive quarry interests, in which he accumulated a large fortune. After several terms in the State Legislature, during which period he was author of the law authorizing formation of corporations, he served from 1876 to 1878 as Lieutenant Governor, and from 1878 to 1880 as Governor. In 1889 he entered the cabinet of President Harrison as Secretary of War, resigning in 1891 to accept an appointment as United States Senator, succeeding George F. Edmunds. He was elected for a full term of six years in 1893 and was reëlected in 1899 and in 1905. Early in 1898 he visited Cuba to inform himself as to conditions in the island, and on the information obtained by him, especially regarding

Weyler's reconcentrado system, the McKinley administration's decision to adopt a policy of intervention is said to have been largely based.

PROCTOR, Richard Anthony (1837–88). An English astronomer, born at Chelsea, London. He was educated at King's College, London, and at Cambridge, where he was twenty-third wrangler. He devoted himself for some time to literary pursuits and wrote articles for the *Popular Science Review* and other magazines. He edited the *Proceedings* of the Royal Astronomical Society in 1872–73, constructed star charts and made researches into the transits of Venus in 1874. He visited America and lectured in 1873–74, 1875–76, 1881, and 1884, when he settled in Missouri. He removed to Florida in 1887, but was summoned on business to England in 1888. He died in New York on his way to England. He was one of the greatest popularizers of science and founded *Knowledge*, a popular scientific magazine, in 1881. Among his works are: *Saturn and his System* (1865); *Half Hours with the Telescope* (1868); *Other Worlds than Ours* (1870); *The Sun* (1871); *The Orbs around Us* (1872); *Transits of Venus* (1874); *Our Place among the Infinities* (1875); *A Treatise on the Cycloid, etc.* (1878); *The Romance of Astronomy* (1880); *Hereditary Traits* (1882); *The Great Pyramid* (1883); *Nature Studies* (1883); *The Universe of Suns* (1884); *Other Suns than Ours* (1885). His *Old and New Astronomy*, upon which he was engaged at the time of his death, was completed by A. C. Ranyard and published in 1892.

PROCU'LIANS. A school or sect of Roman jurists during the first two centuries of the Christian era. Its origin was ascribed to Labeo, the most distinguished jurist of the Augustan age and head of one of the Roman law schools, as the origin of the rival Sabinian sect was ascribed to Capito, head of another law school. Each sect, however, took its name from a successor of its founder: the Proculians from Proculus, who was head, after the elder Nerva, of the law school established by Labeo. Among the noted Proculians were the younger Nerva and Pegasus in the first century, the younger Celsus and Neratius in the second. Consult James Muirhead, *Historical Introduction to the Private Law of Rome* (2d ed., New York, 1899). See Civil Law; Sabinians.

PROC'URATOR-FIS'CAL. In Scotland, a public prosecutor in criminal cases, corresponding somewhat to the district or prosecuting attorneys in the United States.

PROCURER, prō-kūr'ẽr. One who by enticement, force, or other means procures a woman for defilement by another or for prostitution. At common law a procurer was punishable only if he resorted to some act in itself unlawful to accomplish his purpose, as abduction, assault, false imprisonment, drugging, or seduction under promise of marriage. By statute, however, in most civilized countries, including all the American States, the act of procuring a woman for immoral purposes has been made a criminal offense, punishable by fine and imprisonment. See Prostitution; White-Slave Traffic.

PROD'ICUS of Ceos (Lat., from Gk. Πρόδικος, *Prodikos*) (c.460–c.395 B.C.). One of the Greek Sophists (q.v.), long famous at Athens as public speaker and as teacher of rhetoric and ethics. The titles of two of his treatises, *On Nature* and *On the Nature of Man*, are known. He won especial fame by his effort to give precision to the use of words; in this connection his discourse *On Propriety in Language* enjoyed a high reputation. Famous, too, was his apologue, *The Choice of Heracles*, of which we have a version in Xenophon, *Memorabilia*, ii, 1, 21 ff. Consult W. C. Wright, *A Short History of Greek Literature* (New York, 1907), and Christ-Schmid, *Geschichte der griechischen Litteratur*, vol. i, part i (5th ed., Munich, 1908).

PRODUCE EXCHANGE. See Exchange.

PRODUCER GAS ENGINES. See Gas Engine; Internal-Combustion Engine.

PRODUC'TION (Lat. *productio*, a lengthening, from *producere*, to lead forth, from *pro*, before, for + *ducere*, to lead). One of the traditional divisions of political economy, devoted mainly to the consideration of the factors which affect the amount of wealth produced. Among the subjects included under production the chief are: labor and the conditions determining its efficiency; land, and the law of diminishing returns; capital, its origin and productive relations; and the organization of industry. In some of the later works on political economy the treatment of production is merged with that of distribution. See Consumption; Coöperation; Distribution; Exchange; Political Economy.

PRODUC'TUS (Lat. *productus*, prolonged, led forward, p.p. of *producere*, to lead forward, produce). An important genus of fossil brachiopods found in Upper Devonian and especially in Carboniferous rocks. The shells are usually semicircular in outline, with straight hinge line, concave or flat dorsal and very convex ventral valve, both of which are often much produced anteriorly. The beak of the dorsal valve is depressed, while that of the ventral valve is very prominent and often projects far behind the hinge line. The outer surface has radial or concentric wrinkles, and the ventral valve has generally a number of long curved hollow spines by which the shell was anchored to the muddy or sandy bottom. The genus *Productus* is a well-known index fossil of the Carboniferous system. Consult Hall and Clarke, "Introduction to the Study of the Genera of Palæozoic Brachiopoda," in *Palæontology of New York*, vol. viii, part i (Albany, 1892).

PRO ECCLESIA ET PONTIFICE, prō ĕk-klē'shĭ-å ĕt pŏn-tĭf'ĭ-sē (Lat., For Church and Pope). A papal order instituted in 1888 by Pope Leo XIII on the occasion of the jubilee commemorating the fiftieth anniversary of his entrance into the priesthood. The silver cross of the order bears the papal arms surrounded by the motto *Pro Ecclesia et Pontifice*, with the date of foundation on the arms of the cross. On the reverse is a bust of Leo XIII with comets on the arms of the cross. The order is conferred in recognition of devotion to the papacy.

PRŒTUS, prē'tŭs (Lat., from Gk. Προῖτος, *Proitos*). The son of Abas. He was expelled from Argos by his twin brother Acrisius (see Danaë), but with the assistance of Iobates of Lycia was restored to his Kingdom. His three daughters were made mad by Dionysus or Here, and the contagion spread among the other women of Argos. They were cured by Melampus and Bias, between whom Prœtus agreed to divide his Kingdom. Bellerophon (q.v.) was charged by the wife of Prœtus with improper proposals, and Prœtus attempted to put him to death by means of a letter to Iobates. Perseus turned Prœtus into stone through the sight of the Medusa head in revenge for his having expelled Acrisius from his Kingdom.

PRŒTUS. A genus of trilobites, the species of which range through Ordovician to Carboniferous rocks and are particularly common in the Devonian. They were small animals with a convex elliptical carapace, semicircular head, with prominent rounded glabella and large eyes and distinct thickened margin. The thorax is made up of 10 segments, and its elevated axis is continued on to the semicircular marginate pygidium. See TRILOBITA.

PROFAN′ITY. Judicially defined in an American case as the act of "irreverently, disrespectfully, or contemptuously taking the name of God in vain." Profanity was punishable as blasphemy by the ecclesiastical law in England and in the Puritan Commonwealths in the Colonial history of the United States. It is now a common-law offense and in many of the United States a statutory offense to use profanity in public; but it is not a crime to swear profanely to oneself or "in a proper place." See BLASPHEMY.

PRO′FERT (Lat., he produces). See OYER.

PROFESSIONAL EDUCATION. The training that fits men for the special vocations in which science is applied to the practical purposes of life. It supposes as its basis the knowledge and discipline which general culture affords. The leading professional schools in the United States, following the example set by European universities, require a liberal education as a prerequisite for matriculation.

Professional education in Europe conforms to two general types—the centralized systems of France and Germany and the more independent institutions of the British Isles. The French system since the Revolution has displayed at certain periods an extensive governmental control. This was confirmed by the Ferry legislation of 1879 and 1880 dealing with secondary and higher instruction and was relaxed somewhat by the Act of 1896, which enlarges the powers of the universities and the responsibility of the communities in which they are situated. The *baccalauréat*, or graduation from a secondary school, is now required for entrance to state professional courses. Preparation for the professions is afforded by the faculties and schools of the state universities and by the free (independent) faculties whose graduates must take the state examinations. There are 12 preparatory schools and 8 schools of full functions (*écoles de plein exercise*) teaching medical and pharmaceutical science, their students being examined for the doctorate by university faculties. The study of theology has been abolished in the state universities. In 1913 there were in the state institutions 16,763 students in law, 9744 in medicine, 1565 in pharmacy. There are, in addition to the state institutions, a number of private universities or free faculties (e.g., five in law and one in medicine and pharmacy), attended by about 1200 students. The course in law covers three years, certain requirements being added in each for a doctorate; in medicine four, after which two years must be spent in hospital practice. Midwives are obliged to study for a year in an institution of medical instruction and undergo an examination. Diplomas are granted to foreign students, which confer the doctor's degree without conveying the right to follow a specified profession in France. The government alone bestows degrees, with the exception of a few universities which grant their own degrees or diplomas to foreigners, but these have neither the standing nor the validity of government degrees. With a few exceptions the departments of France and Algiers maintain elementary primary normal schools for men and for women; some maintain superior primary normal schools; and Paris has two superior normal schools for men and for women teachers of secondary schools.

Professional training in Germany shows less than in France the influence of legislation and to a greater degree is built on the foundation of the early universities. The certificate of a Gymnasium admits to professional courses. The 21 universities maintain faculties of theology, jurisprudence, and medicine, with the exception of Münster, which has no medical school. In 1914 the students of theology numbered 6393; of law, 10,577; of medicine, pharmacy, and dentistry, 17,331. The numerous pedagogic systems which German thought has produced have profoundly influenced the special preparation of the teacher and stimulated the development of teachers' training schools.

Professional education in Great Britain and Ireland is supplied by the universities of Oxford, Cambridge, Scotland's four university foundations, the University of Dublin, Belfast University, and by a number of newer institutions, including London, Durham, Manchester, Liverpool, and Leeds National universities and the University of Wales. A joint board appointed by the four Inns of Court in London examines candidates for admission to legal study in the Inns, and the Council of Legal Education, nominated by the Inns, superintends studies and examines students for the bar. There are numerous provincial medical schools. The preparation of teachers has enlisted much effort, denominational and undenominational; and many training colleges, for women as well as for men, have been established.

In the United States only two professional schools existed in 1776—the Medical College of Philadelphia (now the medical department of the University of Pennsylvania) and the medical department of King's (now Columbia) College, the former established in 1765, the latter in 1768. Harvard University Medical School was established in 1782 and the Dartmouth Medical College in 1797. Theological instruction was obtained in the few colleges then existing, which were usually provided with chairs in Hebrew and theology. Private schools of divinity were not unknown; but the theological seminary proper was the product of a somewhat later day. The Seminary of the Reformed Dutch Church was established in 1784; St. Mary's, in Baltimore, under the direction of the Society of St. Sulpice, in 1791; and the Theological Seminary of the Associate Presbyterian Church of North America, at Service, Beaver Co., Pa., 1794. The earliest law school in America was established at Litchfield, Conn., in 1784. The growth since the eighteenth century in the number, teaching force, equipment, endowment, and attendance of American professional schools has been remarkable. In 1913 there were 179 schools of theology, with 10,965 students, 1269 instructors, grounds and buildings worth $23,296,518, endowments amounting to $38,514,924, and libraries containing 2,933,587 volumes. The law schools numbered 124, having 20,878 students, 1460 instructors, grounds and buildings valued at $5,458,822, endowment funds equal to $2,315,245, and 988,893 volumes in their libraries. Schools of medicine numbered 108, having 17,238 students, 7290 instructors, grounds and buildings worth $27,585,874, funds of the value of $12,679,436, and 626,307 volumes. The 48 dental schools were attended by 8015 students, instruction was given by 1441 instructors, the value of grounds and buildings was $2,785,237, and books numbered 108,118. There were 75 schools of pharmacy, with 6165 students and 784 instructors. There were 22 veterinary schools, with 2324 students, 350 instructors. Not fewer than 1094 schools, connected with hospitals, with courses of two or three years, were engaged in the training of nurses, the number of whom under instruction was 34,417. In 1833 the first teachers' classes were formed in New York academies. The first American normal school was established at Lexington, Mass., in 1839. The number of public normal schools in 1912–13 was 230, with an attendance of 87,172. There were also 54 private normal schools, with an attendance of 7283, while normal schools and high schools, aggregating 1480 institutions, were giving normal instruction to 121,506 students. That year 20,872 students graduated from normal schools. Delaware and Nevada are the only States without normal schools, and these make provision for the training of teachers. Engineering keeps step in development with the sciences of which it is an application and the material expansion which has called it forth. Provisions for instruction in the sciences which lead to the engineer's diploma have multiplied in an extraordinary degree in the last 50 years. The establishment of State colleges of agriculture and the mechanic arts in all the Commonwealths under the Federal Act of 1862 gave an impulse to education in husbandry and engineering, particularly the latter. In 1913 the departments of engineering and architecture in land-grant colleges and universities reported students as follows: mechanical engineering, 3830; civil engineering, 3392; electrical engineering, 3027; chemical engineering, 598; mining engineering, 796; textile engineering, 69; architecture, 713.

The following table shows the respective ratios at three different periods between the numbers engaged in seven of the professions and the total population:

	Clergymen	Lawyers	Physicians	Dentists	Veterinarians	Engineers	Teachers
1860................	837	947	576	5,608	8,212	1,145	284
1890................	710	699	598	3,579	9,643	1,448	183
1900................	680	663	575	2,563	9,303	808	173
1910................	679	752	582	2,299	7,910	452	148

The history of professional education is distinguished by the development of new professions, which for the most part have sprung out of the older professions by differentiation. Dentistry is an offshoot from the surgeon's art. Modern veterinary medicine may be said to have originated in attempts to apply the principles of pathology and therapeutics to treating the diseases of animals. In 1873 systematic training for nurses began in the Philadelphia Lying-in, Charity, and Nurse School, which opened in 1828. Medical practice has developed numerous specialties, such as the oculist's, the aurist's, the obstetrician's, besides the major division into physic and surgery. A comparatively recent division of medical practice is State medicine, which has to do with public restrictions for the protection of the general health. It should be noted that the profession of teaching is constantly subdividing; and in this movement a new educational function has been evolved, that of supervision and inspection, not yet recognized generally in special teaching courses, but accepted in all successful school systems. The decreasing proportion of men in the secondary schools of the United States is a fact which educators regard with interest and some concern.

Closely related to teaching is the new profession, librarianship, represented by 11 prominent schools, including the departments of library science maintained in several universities. The New York State Library School and the University of Illinois Library School admit only college graduates to the courses in library training. The course in these two institutions is two years and leads to the degree of B.L.S. Accountancy is taking rank as a profession and is so recognized by statute in New York, Pennsylvania, Maryland, and California. The last few years have recorded the appearance of commercial courses in universities and academies, leading to diplomas and certificates as well as a title, certified public accountant (C.P.A.), which is protected by law.

Some of the States have exercised a potent influence by assisting in the rapid extension of the high-school system, thus affording the means of a thorough preparation for the professional school. State universities maintaining professional and technical departments present still another form of State assistance. The United States government has no jurisdiction over the practice of professions in the several States, but, owing to the efforts of the organizations in the several professions within the last 30 years, much has been done by State Legislatures towards protecting the public against incompetency. The important work done by the American Medical Association and the Carnegie Foundation in raising the standards of medical education as well as the preliminary requirements may be mentioned. The latter institution is at present also coöperating with several engineering societies and with the American Bar Association in a study of the preparation for these respective professions. State supervision now extends to preliminary education, length of courses, degrees and the power to confer them, and entrance to practice, and is effected by means of registration, examination, and license. By registration the status of schools and colleges and the value of their credentials receive State approval, and their graduates are admitted to examination for license. The tendency of special schools to become connected with some recognized university has also had a very salutary effect on professional education.

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PROFESSIONAL WOMEN'S LEAGUE, THE. An organization in New York City, incorporated in February, 1893. The aims of the league are to bring together women engaged in dramatic, musical, literary, artistic, and scientific pursuits for mutual help and encouragement, to offer pecuniary assistance when in need, to provide class instruction in literature, art, language, music, and other studies at lowest possible rates, and to assist members to obtain outfits necessary to securing employment. Active membership in the league is confined to women engaged in dramatic, musical, or literary pursuits. The dues for active and associate members alike are $7.50 a year, and in addition each member, upon being admitted to membership, pledges herself to contribute two articles yearly which can either be sold in the bazar or utilized in the costume department.

PROFESSOR, THE. A novel by Charlotte Brontë (1856), written in 1846.

PROFESSOR AT THE BREAKFAST TABLE, THE. A series of sketches and verses by Oliver Wendell Holmes, contributed to the *Atlantic Monthly* and published in 1860. The plan is the same as in *The Autocrat of the Breakfast Table*, but the tone is more serious.

PROF'IT (OF., Fr. *profit*, from Lat. *profectus*, progress, increase, profit, from *proficere*, to advance, make progress, be advantageous, from *pro*, before, for + *facere*, to make). The excess in the selling price of goods above their cost of production. The term has been variously used, both in common speech and in economic writings, according to the conception of the elements entering into cost. Many of the earlier economists did not regard interest as a "cost" and hence included it under the term "profit." The rent of land, however, though not regarded as an element in cost, has not usually been classed with profit, although the term "agricultural profit" is not infrequently applied to it in popular writings.

Modern economists usually exclude from profit the normal or average return to capital, which is classed as interest (q.v.). Whatever an enterprise earns above interest, rent, and wages (including normal wages of management) is profit. If this net income is due to an artificial raising of prices through manipulation of supply, it is known as monopoly profit, or monopoly return. Various theories have been advanced to explain the nature and causes of nonmonopolistic profit. The oldest of these is the "risk theory," defended by Von Thünen and many later German and some American writers. A business undertaker necessarily incurs a large number of risks which are of too indefinite a nature to be covered by insurance. Since the chance of losing a certain sum is not compensated for by an equal chance of gaining the same sum, no one would undertake the management of business unless it normally afforded a greater volume of gains than of losses. The net gain, in this view, constitutes profit.

A second view, represented by Francis A. Walker, regards profit as a differential gain, imputable to superior management. Prices, it is held, are fixed in the long run by the cost to the least efficient managers who are able to continue production. All managers of greater efficiency produce at lower cost, thus securing a surplus analogous to rent (q.v.). A third theory, not differing from this in essence, ascribes profit to the scarcity of managers of the better grades. This theory sometimes confuses simple profit with monopoly return, through failure to distinguish between scarcity and monopoly values.

Finally, profit has been explained with reference to the dynamic elements that prevent industry from reaching an equilibrium. In this view, which is in the main that of J. B. Clark, labor and capital tend towards a state of uniform productivity, but, owing to friction and to technical improvements, may at any moment vary considerably in productive power. Since the pay of each unit of labor or of capital tends to equal the product of the unit least advantageously situated, those units which happen to be in the more productive situations yield a surplus or profit which the entrepreneur secures for himself. It would appear that the theories given are not mutually exclusive, but merely describe different elements in a composite form of income now commonly termed profit. See INTEREST; MONOPOLY.

PROFIT A PREN'DRE. A right to take profit, i.e., something produced or yielded by the land, from the land of another, as the right to take coal, minerals, gravel, seaweed, grass, game, etc. Profits, as they are shortly termed, are of three kinds: profits appendant, which are of common right and are apparently survivals of ancient common rights of pasturage; profits appurtenant, which may be exercised in another's land by the owner of and solely for the benefit of other land, known as the dominant tenement; and profits in gross, which are held by an individual as a personal right irrespective of any land that he may own. No new profits appendant can be set up, but profits appurtenant and in gross may be gained either by grant or by prescription, and may be alienated, the former as a general rule only as an incident of the land to which it is appurtenant, the latter to any one, but only as a single, entire right which may not, for fear of surcharging or overburdening the servient estate, be distributed among several owners. For the same reason a profit cannot be acquired by a community, as such, by custom. As late as Blackstone the term "common" was used in place of profit, as common of pasture, etc. See EASEMENT, and consult authorities referred to there and under PROPERTY.

PROFIT SHARING. A modified form of

the wages system by which wage earners receive a part of the surplus of the industry according to some understood plan. Overseers receive salaries, capitalists interest, wage earners wages, and what remains is divided among these classes, who all are responsible for success or failure. A part or all of the wage earner's share may be given in cash; or it may be held in trust, invested in capital stock as savings to be used by them in cases of emergency; or it may be used as a social, educational, or amusement fund.

Profit sharing is based upon the principle that work done varies with the degree of interest felt by those who perform it. Profits may be increased by the wage earner by increasing the quantity of the product, by improving its quality, by better care of implements, by a decreased loss of materials, by lessening superintendence, and by avoiding quarrels with employers. The extent to which profits may be increased varies also with the extent to which the wage earner is made a sharer in profits, the form in which his share is increased, his intelligence, and the character of the industry. Profit sharing has been successful in many industries, and has sometimes failed where the methods employed were copied from those which had met with success. Upon the whole profit sharing has been most successful in handicrafts where there is a stable market for the products and where the price paid for labor is a large part of the cost of production.

The origin of profit sharing is unknown. It is said that the American financier Albert Gallatin made a trial of it in his glassworks, established at New Geneva, Pa., in 1794. John S. Vandeleur, a disciple of Robert Owen, in 1831 tried an extensive experiment in profit sharing on an estate in the County of Clare, Ireland. It was successful in stimulating the interests of the laborers to the great improvement of the estate and of their condition, until it was unfortunately terminated through the loss of Vandeleur's entire property in consequence of his passion for gambling.

The first notably successful profit-sharing enterprise was begun by Le Claire, a French house painter, in 1842. At the time of his death, in 1872, $220,000 had been distributed to workmen as their share of the profits. According to his plan capitalists received 5 per cent on capital invested, managers were paid salaries, wage earners wages, and then from the profits remaining one-fourth went to the capitalist class, one-fourth to a Mutual Aid Association of Workmen, and one-half went to wage earners directly. Since Le Claire's death his business has been conducted on similar lines. At the present time the Association of Workmen receives 5 per cent of interest on its capital as a half owner of the business and also about 20 per cent additional to its wages, which are about as high as those paid for similar lines of work in Paris. Laroche Joubert, a paper manufacturer, adopted the system in 1843 and the Orléans Railroad Company in 1844. In 1847 J. H. von Thünen introduced the system on his estate near Zellow in Mecklenburg-Schwerin, where his son and grandson, succeeding in turn to the proprietorship, continued it in force. In 1875 there were about 75 profit-sharing establishments in France, and in 1878 a society of the proprietors and directors of these was formed in Paris for a comparative study of methods.

In the Bon Marché, one of the largest retail stores in the world, a scheme of profit sharing and industrial coöperation prevails. Of the capital to the amount of 20,000,000 francs, 7,500,000 is held by employees; 6 per cent is paid on capital. The profits shared assume four forms: the heads of departments to over 100, whether they have capital invested or not, participate in the profits according to the percentage of sales; the retiring fund draws about 5 per cent of the profits; the provident fund takes another share; and what remains is then divided pro rata. Another successful experiment in profit sharing was begun by Godin, a stove manufacturer, at Guise, about 1872. In the first 15 years $650,000 were distributed to the workmen in dividends, and a considerable amount besides was invested in capital stock. In France more than 100 such enterprises are managed with success at present. Elsewhere on the Continent there are comparatively few instances. According to a report of the Labor Department of the Board of Trade (1913) there were in the United Kingdom 133 instances of profit sharing in existence, with 106,189 employees. The report also enumerates 163 instances of abandoned schemes of profit sharing.

Conspicuous examples of successful profit sharing in the United States are those of the Proctor and Gamble Company, of Cincinnati, Ohio, and the N. O. Nelson Manufacturing Company, of St. Louis, Mo. The former company employs largely unskilled wage earners, who receive comparatively low wages. During the year 1886 the work of the company was interfered with by many strikes, and in the following year profit sharing was introduced to establish harmonious relations with the employees. Reasonable salaries were allowed the active members of the firm, interest was allowed on the capital, and the net profits were divided between the firm and "the employees, in the proportion that the wages paid bore to the whole cost of production." Although the profits received by the wage earners increased their income considerably, they were indifferent to the success of the enterprise until the company divided them into four groups based upon their interest in the work, its excellence, and the prevention of waste. The best group received twice the regular dividend, the second the regular, the third one-half the regular dividend, while the careless and indifferent received none at all. The wholesome influence of this discrimination was at once seen in larger dividends. The stockholders did not profit directly by this scheme, but the better profited at the expense of the poorer workmen. When the firm became a stock company, in 1890, wage earners were to receive a dividend of 12 per cent on wages, which was the same as the profits on common stock. The number of employees receiving profits increased from 225 in 1887 to 550 in 1899, the latter number being 92 per cent of the total number of wage earners. Employees are encouraged to become owners of stock, and 80 of them own 191 shares. Beginning with 1894, $500 is set aside semiannually as a pension fund, of which one-half is contributed by the company and the other half comes from the bonuses of the employees. Since the beginning of the experiment no strikes or labor difficulties have arisen. In 1894 the labor cost, including the 12 per cent bonus to wage earners, was only 63 per cent of what it had been in 1886.

The N. O. Nelson Company, brass manufacturers, of St. Louis, Mo., began a profit-sharing enterprise in 1886. The company pays out all sums needed in cases of sickness and disability as they occur, as a part of the costs of the business. Allowances are made for funeral expenses, and upon the death of an employee his family is supported to the extent of two-thirds of his wages until it is able to support itself. The crucial test of profit-sharing enterprises is given in periods of crises, when extra efforts of wage earners are not rewarded by dividends. It is then that wage earners lose interest in them, and the mortality rate of profit-sharing enterprises is high. For the first 10 years, 1887–97, the dividends to employees were large. In two years, 1893 and 1896, there were no dividends for employees. That no labor difficulties arose and that wage earners did not lose interest in profit sharing, even though wages were reduced one-fourth, was due largely to the wisdom of the company. Salaries and interest were reduced to the same extent as wages, but the one-fourth thus deducted from these shares was to be paid out of future profits before any bonuses were to be paid. In each instance it was not long before the company was on a dividend-paying basis, and profit sharing weathered the storm in safety. One other feature of the management of the N. O. Nelson Company shows how profit sharing may pave the way to industrial coöperation. In 1896 the company made a proposal to employees in the cabinetmaking shop which provided for the gradual purchase and management of the enterprise by the employees. The proposal, at first rejected, with a few changes was soon after accepted, and at present this department is owned and managed exclusively by employees.

On Jan. 1, 1903, the United States Steel Corporation announced a plan of profit sharing. Only those employees who hold positions of responsibility share directly in the profits of the corporation. If the net earnings for the year exceed $80,000,000, but are less than $90,000,000, 1 per cent of such earnings is to be distributed among the employees, the share to be determined by the finance committee, so as to permit the fullest recognition of merit. With every $10,000,000 increase in net earnings the share to be distributed increases by ⅕ per cent of such increase of earnings. Employees of lower classes are given favorable opportunities for becoming owners of the corporation stocks. Further to encourage the holding of stocks, those who buy such stocks and remain in the service of the company are to receive at the end of five years a bonus of 5 per cent annually on the face value of the stock held over and above the regular dividends, and the promise of a bonus at the end of another five years is given. The plan appears to have worked well. It has increased stability of employment and the loyalty to the company of the classes affected by it.

The most widely discussed plan of profit sharing in recent years is that instituted by Henry Ford in the Ford Motor Works of Detroit in 1914. According to this plan, of the estimated $20,000,000 net profits for the year, one-half was to be added in the form of a bonus to the wages of some 15,000 workers, thus creating three grades with wages of $5, $6, and $7 respectively, for an eight-hour day. The plan is not strictly a profit-sharing plan, since there is no prearranged division of profits, and is subject at any time to change at the will of the employer. Other features that differentiate it are the strict control over the private life of the employees—requirements as to thrift, standard of living, etc., and the more rigid discipline in the shops.

Bibliography. C. F. Robert, *La suppression des grèves par l'association aux bénéfices* (Paris, 1870); V. K. Böhmert, *Die Gewinnbetheiligung* (Leipzig, 1878); Sedley Taylor, *Profit Sharing between Capital and Labor* (London, 1884); F. H. Giddings, "Report on Profit Sharing," in *Nineteenth Annual Report of the Massachusetts Bureau of Statistics of Labor* (Boston, 1886); N. P. Gilman, *Profit Sharing between Employer and Employee* (ib., 1896); id., *A Dividend to Labor* (ib., 1899); Adams and Sumner, *Labor Problems* (New York, 1905); André Payer, *La participation aux bénéfices* (Paris, 1911); Maurice Duhamel, *Participation aux bénéfices et participation au capital* (Lille, 1912); British Board of Trade, *Report on Profit-Sharing and Labour Copartnership* (London, 1912); C. R. Fay, *Copartnership in Industry* (New York, 1913); Aneurin Williams, *Copartnership and Profit Sharing*, in Home University Library (ib., 1914).

PROFLUVIUM. See FLUX.

PROGNO'SIS (Lat., from Gk. *πρόγνωσις*, foreknowledge, from *προγιγνώσκειν*, *progignōskein*, to know beforehand, from *πρό*, *pro*, before + *γιγνώσκειν*, *gignōskein*, to know). The opinion or decision of the physician as to the probable course and termination of a disease. As the case proceeds the rapidity or severity of the symptoms, the condition of the circulation, ability to take food, the integrity of the nervous system, are points which influence the prognosis. The usual questions to be answered by a skillful prognosis are as to whether the disease will terminate in death or recovery; if in recovery, whether permanent damage to any organ will result; if in death, the probable duration of the disease.

PRO'GRAMME MUSIC (Lat. *programma*, from Gk. *πρόγραμμα*, edict, from *προγράφειν*, *prographein*, to write before, from *πρό*, *pro*, before + *γράφειν*, *graphein*, to write). A term in music applied to purely instrumental works which are intended to reproduce by musical tones a series of definite ideas or events. The idea of reproducing characteristic sounds of nature by means of music is very old. We have a composition by Jannequin, *Cris de Paris*, published in 1529, in which are imitated the cries of Parisian fishmongers and venders of various commodities. In another, *La bataille*, the same composer imitates the rattling of musketry, trumpet signals, etc. In his "Pastoral Symphony" Beethoven reproduces the murmuring of the brook and the calls of various birds. Schubert in his famous song *Gretchen am Spinnrad* imitates admirably the hum and buzz of the spinning wheel by the figure in the accompaniment. But Schumann went further; he gave some purely instrumental works (Carneval) suggestive titles. These instances do not in reality constitute programme music. Some regard Berlioz (q.v.) as the founder of modern programme music. Although much of his music belongs to this category, he cannot be regarded as the real originator, because he constantly clung to the form of the classic symphony. The credit of establishing modern programme music as something new and independent of classic forms belongs to Liszt (q.v.), who wrote long orchestral works (symphonic poems) in a free and very elastic form, where every measure is meant to depict some definite emotion or event. He found his inspiration in works of poetry or the plastic arts. Thus, *Die Hunnenschlacht* is intended to reproduce in musical tones the impression aroused by Kaulbach's famous picture. In his Dante and Faust symphonies Liszt has taken certain episodes from Dante and Goethe, and he intends to say in music what the two poets have said in words. The unifying principle is the leading motive (see LEITMOTIV), which is treated and developed as in the Wagnerian music drama. Wagner occupies a distinct position. In one sense his music is programme music, but it is dramatic, and always accompanies and illustrates the spoken word. And even in the purely instrumental passages, such as the Preludes, Siegfried's Rhine Journey, Funeral March (*Götterdämmerung*), his method of leading motives enables the hearer to follow every measure in detail. In spite of opposition progressive composers took up the new art, which gradually won favor. And when finally the greatest master of programme music, Richard Strauss (q.v.), gave to the world his wonderful tone poems (*Death and Apotheosis, Till Eulenspiegel, Ein Heldenleben,* etc.), all opposition was silenced. Another type of programme music, which dispenses with thematic development, confining itself rather to the delineation of moods and impressions, was inaugurated by Debussy (q.v.), and also found numerous followers. Consult W. Klatte, *Zur Geschichte der Programmusik* (Berlin, 1905), and O. Klauwell, *Geschichte der Programmusik* (Leipzig, 1910). See ABSOLUTE MUSIC; INSTRUMENTAL MUSIC.

PROGRESO, prō-grā′sō. A seaport of Mexico, situated on the north coast of the Yucatan peninsula, 25 miles north of Mérida (Map: Mexico, O 7). It is the port of that city, and is connected with it by railroad. It is the principal port of the State of Yucatan. Steamship lines connect the town with Vera Cruz and various ports of the United States. In 1911–12 it ranked third in importance among the Mexican seaports, with exports valued at $10,445,557 and imports $4,242,618. A United States consulate is located here. The chief export is sisal grass. Pop., 1900, 5175.

PROGRESS AND POVERTY. See GEORGE, HENRY.

PROGRES′SION (Lat. *progressio*, from *progredi*, to go forward, from *pro*, before, for + *gredi*, to go), or PROGRESSIVE EVOLUTION. Naegeli's principle of progression, or the transformation of species from internal causes. Long before Naegeli Van Baer vaguely wrote of the striving towards an ideal in development. Naegeli and his commentator, R. Hertwig, claimed that it cannot be denied that each species is compelled, by some peculiar internal cause, to develop into new forms independently of the environment and up to a certain degree independently of the struggle for existence. In all the branches of the animal kingdom, says Hertwig, we observe a progress going on from lower to higher, very often in a quite similar way, in spite of the fact that the species live under very different conditions of development. To a certain extent, then, an organism is independent of the external world, but the independence is never complete, and Naegeli has not so contended.

PROGRESSION. In music, a term applied to the succession of entire chords or of the individual tones composing any part. The former is called harmonic, the latter melodic, progression. See LEADING OF VOICES.

PROGRESSIONS, IN MATHEMATICS. See SERIES.

PROGRESSIVE BRETHREN. See CHURCH OF THE BRETHREN.

PROGRESSIVE PARTY. A national political party formally organized in a convention held at Chicago, Aug. 5–7, 1912. It is an offshoot of the Republican party, and its formal organization was the outcome of a radical movement within the Republican party dating from the late eighties. This movement was largely agrarian, having its seat in the Middle West, and aimed at the control of corporations, especially railway corporations, the abolition of trusts and other forms of monopoly, and the expulsion of representatives of the corporations from governmental positions of influence. The earliest active progressive Republican campaign was inaugurated in Wisconsin under the leadership of Robert La Follette in the early nineties. The campaign attained success in 1900 with the election of La Follette to the governorship. In 1902 La Follette succeeded in carrying through laws increasing the taxation of railways and instituting direct primaries. Later achievements of the La Follette régime were the organization of a railway commission with power to prescribe rates, an industrial commission with extensive powers over producing corporations, and the enactment of a workmen's compensation act. Other prominent leaders of the progressive movement were Governor Pingree of Michigan, who tried ineffectually to introduce direct primary legislation (1897–1900), Governor Albert Cummins of Iowa, Governor Hughes of New York, and Governor Hiram Johnson of California. The movement in Oregon reached a high development at the opening of the century, resulting in 1902 in a law introducing the initiative and referendum. In national affairs Progressive Republicanism appeared dominant in the second Roosevelt administration. In the reactionary Taft administration the progressive movement in Congress became clearly marked in 1909 in the fight against the Payne-Aldrich Tariff Bill, led by Beveridge, Bristow, Clapp, Cummins, Dolliver, and La Follette, and in 1910 in the fight on the House rules. The President threw his influence against the Progressives, and the latter organized a movement in the party against his renomination. La Follette was at first regarded as the logical candidate to oppose Taft, but, as he appeared not to develop sufficient strength, the majority of the Progressive Republicans went over to Roosevelt. In the Republican Convention held at Chicago, June 18–22, 1912, the Taft supporters, through their control of the National Committee and consequent power of determining all contests for seats in the convention, were able to assure a majority for Taft on the first ballot. It was not claimed that Roosevelt had enough uncontested delegates to nominate; but the Roosevelt supporters asserted that but for the "steam-roller" methods of the National Committee Taft would not have had sufficient delegates to nominate, certainly not on the first ballot. Roosevelt and many of his supporters withdrew from the convention and made arrangements to meet in an independent convention later. This convention, assembled August 5, unanimously nominated Roosevelt for the presidency and Hiram Johnson of California for the vice presidency. The platform adopted, described as a "contract with the people," proposed a wide range of reforms, political and social economic. Under the first head were planks proposing the adoption of a constitutional amendment making the process of amending the Federal Constitution simpler, favoring direct primaries, including the presidential preference primary, the initiative, referendum, and recall. Under the latter head were planks favoring legislation to prevent industrial accidents, workmen's compensation laws, prohibition of child labor, establishment of minimum wages, relief of unemployment, etc. Strong planks were also adopted regarding conservation of national resources, the regulation of corporations through a commission analogous to the Interstate Commerce Commission, income and inheritance taxes, etc. In the campaign that followed, while many of the leaders of the progressive movement in the Republican party held aloof from the new party, a very large proportion of the rank and file of the Republican party joined the Progressives. Roosevelt received 4,126,020 votes, as compared with 3,483,922 for Taft, and 88 electors, as compared with 8 for Taft. Roosevelt carried the States of California, Michigan, Minnesota, Pennsylvania, South Dakota, and Washington, while Taft carried only Utah and Vermont. That the Progressive strength was drawn almost entirely from the Republicans is indicated by the extremely close relation between the popular vote for Wilson and that for Bryan in the preceding election.

In the gubernatorial elections of 1914 there appeared a manifest drift of Progressives back to the Republican party. Only in California was there any very marked increase in Progressive votes. It was a question widely discussed among Progressive leaders in 1915 whether the party as an independent organization had not fulfilled its purpose in effecting the defeat of Taft and the reactionaries in the Republican party in 1912. Consult: Munsey, *The New Progressive Party* (New York, 1912); Payne, *The Birth of a New Party* (ib., 1912); Roosevelt, *Progressive Principles* (ib., 1913); Duncan Clark, *The Progressive Movement* (ib., 1913); De Witt, *The Progressive Movement* (ib., 1915). See REPUBLICAN PARTY.

PROHIB′ITED DEGREES. The degrees of kinship and affinity within which persons are forbidden to intermarry. By the English Book of Common Prayer 30 such relations are stated as "forbidden in Scripture and our laws to marry together." The list there given comprehends all ascendants and descendants in the direct line as well as all those of a deceased wife or husband, and collaterals to the second degree. First cousins are not within the prohibited degrees by the English law, but in a few of the American States the intermarriage of persons so related has been forbidden by statute. By Act of Parliament (1907, 7 Edw. VII, c. 47) it was provided that a man might lawfully marry his deceased wife's sister, but marriage to a deceased husband's brother is still under the ban in Great Britain, though everywhere in the United States it is allowed. See AFFINITY; CONSANGUINITY; MARRIAGE.

PROHIBITION, prō′hĭ-bĭsh′ŭn (Lat. *prohibitio*, prevention, from *prohibere*, to forbid, prevent, from *pro*, before, for + *habere*, to have). A form of sumptuary legislation which attempts to abolish the manufacture and sale of alcoholic liquors. Until after the Civil War the movement towards prohibitive legislation in America was merely local. By that time, however, a marked change was observed in the liquor business. German beer was introduced, great breweries were built, attractive saloons were fitted up, and other efforts were made to increase sales. One of the earliest State and national forms of prohibition forbade the sale of liquor to Indians. Some of the early laws enacted local option—which may be local prohibition—following Connecticut's (1839) example. Maine was the first State to establish prohibition. The West Indian trade brought large quantities of rum into the State, and in 1846 an educational campaign was carried on, which resulted in Neal Dow's law. This law was made effective in 1851 and was finally incorporated into the State constitution. In 1852 Massachusetts, Rhode Island, and Vermont passed laws prohibiting the sale of liquor, which were subsequently repealed by the two former States. In the period 1880–1900 a strong movement for prohibition developed in the Middle West, resulting in prohibitory laws in Kansas, Iowa, and the Dakotas. Towards the end of this period the movement subsided sufficiently in effect to withdraw Iowa from the prohibition column through the enactment in 1894 of the Mulct Law (repealed, 1915), by which liquor dealers, though operating in violation of the law, could be prosecuted only at a certain frequency and fined only up to a certain limit—a method intended to transform the prohibition system into a high-license system. Prohibition was later repealed in the Dakotas to be reinstituted in North Dakota in 1914. Oklahoma (1907) and Idaho (1915) also "went dry."

A notable development of prohibition early in the twentieth century occurred in the South. Here the animus was partly political, opposition to the influence of the liquor trade in politics; partly a measure for reducing disorders among the black population; partly economic, as liquor consumption was felt to be a handicap to efficiency. The moral and sumptuary motives played a part, but not a major part. The result of the movement was Statewide prohibition in Georgia (1907); Alabama (1907; virtually repealed, 1911—see ALABAMA, *History;* reënacted, 1915); Mississippi and North Carolina (1908); West Virginia (1912); Virginia (1914); Arkansas and South Carolina (1915). As part of the general movement may be included the success of the prohibition forces in Arizona, Colorado, Oregon, and Washington (all 1914). The dates here given are those of the popular vote or legislative enactment which decided the question. It was certain, in November, 1915, that by the next year, when certain State laws would go into effect, 19 States would be wholly under prohibition.

In addition to the State-wide prohibitory areas, there should be included the local-option prohibitory areas, which are many. In some cases the unit of local option is the county, as in Delaware, Alabama, Kentucky. In other cases the unit is the township, or even the incorporated town or city, or ward thereof. As a rule, the narrower the unit, the less effective is this means of suppressing the use of liquor. Prohibitionists assign a high value to local option as a means of preparing the way for Statewide prohibition. This in turn is regarded not only as an end in itself, but as a means of attaining national prohibition. An agitation for a national constitutional amendment has achieved notable strategic success in forcing a vote in Congress (1914). In the House it received a majority, but not the necessary two-thirds. In 1915 there were only three States that had neither State-wide prohibition nor some form of local option—Pennsylvania, New Jersey, and Nevada. It was estimated that by 1916 (when laws earlier enacted would be in effect) at least 50,000,000 persons in the United States would be living in "dry" territory, and that this territory would constitute at least 75 per cent of that of the nation. In the work of securing State-wide and local prohibition and in the movement for a national amendment, many agencies have been active, none more so than the Anti-Saloon League (q.v.), whose *Year Book* should be consulted. These various agencies discovered, after much rivalry and bitterness, that coöperation would sooner accomplish their common purpose.

In a treaty of 1889 between the United States, Great Britain, and Germany prohibition for the Samoan Islands was established. Canada took a plebiscite on prohibition, Sept. 29, 1898, on which occasion 278,487 votes were yeas and 264,571 nays. Since the majority vote was only 23 per cent of the electorate, the government has not felt called upon to initiate legislation. In England the United Kingdom Alliance to procure total and immediate legislation for the suppression of traffic in intoxicating liquors and beverages has worked actively for prohibition. The question of compensation forms a financial barrier to the enactment of a law. In the United States the Supreme Court (Dec. 5, 1887) decided that the Kansas law making no provision for compensation does not violate the Fourteenth Amendment. The "original package" case (Bowman *v.* Chicago and Northwestern R. R., 125 U. S. 465) stated that no prohibition States could prevent interstate railroads and express companies from carrying liquors to any point within the State. While the Wilson Law of 1890 made liquors imported into a State subject to the same police regulations, including prohibition of sale, as liquors produced therein, it did not affect the right of shipment into a State not for sale but for immediate consumption. This fact has limited the efficacy of the prohibition law. A more serious limitation has been the failure of the police authorities, especially in the larger cities, to enforce such laws. The difficulties here noted disappear in proportion to the number of States that abolish the liquor traffic within their own borders.

The most significant advance in prohibition outside of the United States was the abolition of the vodka trade in Russia as a war measure by ukase of 1914—a measure the more notable because it wiped out one of the most important sources of national revenue. Of only less significance were the French ban on the sale of absinthe and the British agitation against drink as a factor militating against efficiency in production of munitions.

Consult: E. J. Wheeler, *Prohibition: The Principles and the Party* (New York, 1889); J. C. Fernald, *Economics of Prohibition* (ib., 1890); *Cyclopædia of Temperance and Prohibition* (ib., 1891); Hugo Münsterberg, "Prohibition and Temperance," in *American Problems* (ib., 1910); Fritz Rudolf, *Das Alkoholverbot in Amerika* (Basel, 1913); Guy Hayler, *Prohibition Advance in all Lands* (London, 1913). See TEMPERANCE; LIQUOR TRAFFIC.

PROHIBITION, WRIT OF. A prerogative writ issued out of a court of superior jurisdiction and directed to the judge of an inferior court, or to a party in a suit in an inferior court, or to any other person whom it may concern, commanding that no further proceedings be had in a cause pending in such inferior court. The writ is of ancient origin, instances of its use by the common-law courts being found as far back as the twelfth century.

PROHIBITION PARTY. The failure of the advocates of temperance to force a prohibition plank upon either of the great national parties led the Pennsylvania State Temperance Convention in February, 1867, to suggest the organization of a separate party. In 1868 a Prohibition party was organized in Illinois and Michigan in response to a recommendation made on May 28 of that year by the Grand Lodge of the Good Templars in session at Richmond, Ind. In May, 1869, the Grand Lodge recommended the calling of a national convention, and in September such a convention was held at Chicago, and the National Prohibition party was there organized. In the State elections of the next three years candidates were nominated by the party, but received relatively few votes. On Feb. 22, 1872, the first National Convention met at Columbus, Ohio, nominated James Black of Pennsylvania and John Russell of Michigan as their candidates for President and Vice President respectively, and adopted a platform which besides advocating prohibition declared for woman suffrage, a direct popular vote for President and Vice President, a sound currency, the encouragement of immigration, and a reduction in transportation rates. In the ensuing election only 5607 votes were cast for the party's candidates. In 1876 Green Clay Smith of Kentucky was nominated for President and G. T. Stewart of Ohio for Vice President, but the ticket received only 9787 votes. In 1880 the candidates for President and Vice President, Neal Dow of Maine and H. A. Thompson of Ohio, received 9678 votes. In 1884 Governor St. John of Kansas was nominated on a platform which, ignoring other issues, declared only for temperance. He made an active campaign and received 150,626 votes. In 1888 the Prohibition candidates, Clinton B. Fisk of New Jersey and John A. Brooks of Missouri, received 249,954 votes, the platform in this year declaring for woman suffrage, uniform marriage and divorce laws, restriction of immigration, a tariff for revenue only, the civil-service reform. In 1892 the platform of the party, besides declaring for prohibition, advocated, among other things, woman suffrage, civil-service reform, anti-monopoly laws, currency reform, and restriction of immigration. In this year the party's candidates, John Bidwell of California and J. B. Cranfil of Texas, received 270,710 votes, the largest number so far recorded. A split in the party occurred in 1896. The party in the South was opposed to a woman's suffrage plank, and the delegates were divided on the money question. Those who wished to confine the party to a single issue were in the majority, and their opponents left to form a Liberal party, whose candidate, Bently, received only about 14,000 votes. The regular candidate (Levering) received 131,757 votes. Dr. S. C. Swallow, who represented the broad-gauge party in 1900, was defeated by John G. Woolley, the nominee of those advocating the single issue, who in the presidential election received 207,368 votes. In 1904 the nominee of the party was Dr. S. C. Swallow, who received 258,550 votes. In 1908 the party nominee, E. W. Chafin, had 252,683 votes; in 1912 the same candidate received 207,965 votes. The organ of the Prohibition party is the *Voice*, which was started Sept. 25, 1884, and published in Chicago.

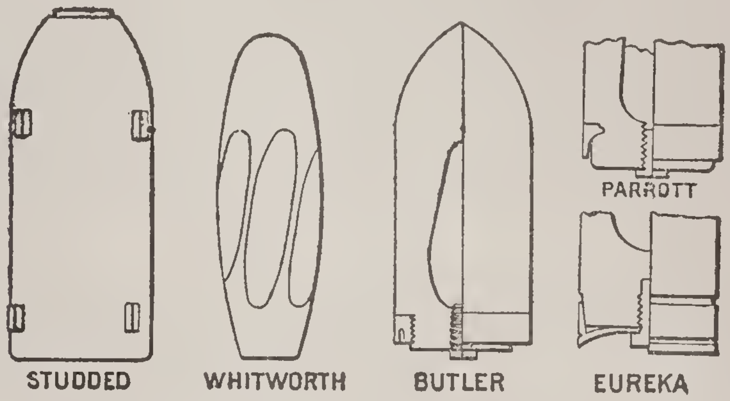
PROHIB′ITORY DUTIES. See TARIFF.

PROJEC′TILES (from *project*, OF. *projecter*, *projeter*, Fr. *projeter*, to project, from Lat. *projectare*, to thrust forth, frequentative of *projicere*, to throw forward, from *pro*, before, for + *jacere*, to throw; connected with Gk. *ἰάπτειν*, *iaptein*, to throw). Objects thrown forward by an impulse of short duration. Projectiles have been a form of offensive weapon from the earliest days of warfare, when a stone or similar missile was thrown from the hand or from some simple device. The development of guns (see ARTILLERY; GUNS, NAVAL) necessitated suitable forms of projectiles. The earliest were of stone, sometimes merely bags of round pebbles. The larger stone projectiles were made to fit the gun loosely and were generally, though not always, spherical and often very neatly and smoothly cut. A few stone elongated projectiles are known to have been used, but they were not common. Iron projectiles came into general use in Europe in the fifteenth century, though stone was used more or less for some centuries after this. The difficulty of tightly closing the breech caused the disuse of breech-loading cannon and prevented the early development of the heavy rifled gun. Rifled small arms (q.v.) using a spherical bullet have been in more or less use for three centuries. Smoothbore guns almost invariably used spherical projectiles very slightly smaller than the bore of the gun, the difference being termed the *windage.*

The resistance to the movement of a projectile through the air is proportional to the cross section perpendicular to the line of flight, and the power of the projectile to overcome the resistance is proportional to its weight multiplied by the square of the velocity. For a given velocity, therefore, we may say that the ratio of power of resistance varies roughly as $\frac{W}{D^2}$, where W is the weight and D the diameter expressed in the usual units. This is not strictly correct, for there are other factors (shape, density of atmosphere, etc.) which enter into a precise calculation, but the statement is approximately true and the expression $\frac{W}{D^2}$ is called the *ballistic coefficient*. It is apparent by inspection that if we have means of increasing the weight without increasing the diameter (i.e., the area of cross section) we shall increase the power of the projectile to overcome the resistance of the air and thereby add to its range and accuracy. The elongated projectile evidently fills the desired conditions, and the advantages of its use are at once apparent. Robins published his treatise on ordnance in 1742, and in it he stated very clearly the advantages of rifled guns and elongated projectiles (see GUNS, NAVAL), but his work was far beyond the comprehension of his contemporaries. See BALLISTICS, *Interior Ballistics;* PROJECTILES, MOTION OF.

The use of smoothbore guns and spherical projectiles continued, and the next important improvement was the development of the shell gun. Incendiary shells designed to burst and scatter balls and fragments of the case had been in use for a long time, but up to 1820 these had very thin walls and were fired solely from mortars. In 1821 the Paixhans shell gun was designed in France, and thereafter explosive shells have formed the greater part of projectiles above a pound in weight.

About the middle of the nineteenth century the rifled gun established itself firmly. Difficulties in the breech mechanism caused some nations to develop muzzle-loading systems of construction, but this false step lasted nowhere more than 25 years. The projectiles for muzzle-loaders necessarily did not fit closely, and this decreased their accuracy. The revolution of an elongated projectile about its axis is necessary to keep the axis steady and prevent the projectile from tumbling or pitching end over end, which would be fatal to power and accuracy. This was effected in muzzle-loaders by means of various rotating devices such as studs, ridges, expanding-base rings or bands, or a bore of special cross section such as that of a polygon or ellipse.



MUZZLE-LOADING PROJECTILES.

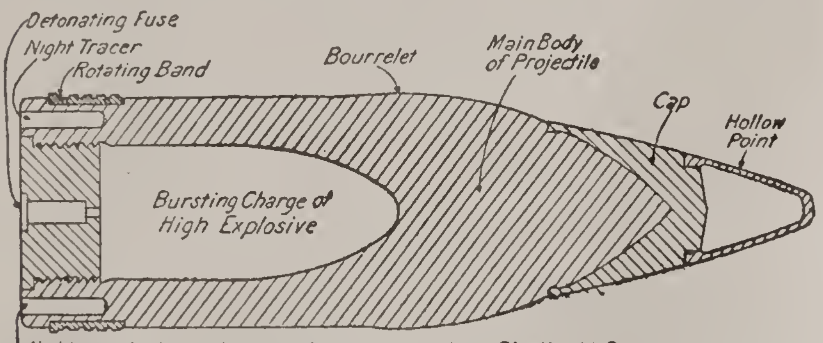
The difficulties connected with developing an effective breech mechanism were soon surmounted, and modern projectiles quickly took on very nearly their present oblong shape. With breechloaders the rotating band could be made larger than the bore (being inserted from the rear) and forced in, the lands or grooves of the rifling cutting shallow channels through the soft metal band. Projectiles for breech-loading rifles were first made of plain cast iron and wrought iron, but the advances in armor brought forth the chilled cast-iron armor-piercing shot and shell, and then the steel shell.

In the days of smoothbore guns projectiles of many kinds were used—solid shot, hot shot (solid shot heated in special ovens), bar shot, chain shot, grape shot, shell, shrapnel, and canister. Bar shot consisted of balls joined by a bar; chain shot, of similar balls joined by a chain; grape shot, of 15 to 25 balls piled on a circular wooden base around a bar or tube and held in place by iron rings and a canvas wrapping; canister, or case shot, of a tin or zinc cylinder with wooden ends and filled with balls packed in wood or sawdust.

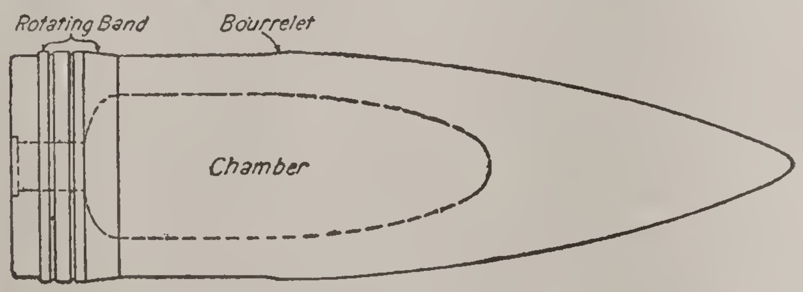
At present projectiles are of three general types—armor-piercing shell, common shell, and shrapnel. Special projectiles for use against air craft are employed to some extent, and hand grenades and bombs—which are not really projectiles—are used by troops and air craft. Canister (q.v.) is also coming into service again for use under special conditions; also illuminating shell and bombs.

Armor-piercing shell are made of tough dense steel, specially hardened. The walls are thick, to enable them to penetrate armor without breaking up, and the chamber for the bursting charge is therefore comparatively small. The bursting charge is usually of high explosive, but in the United States navy black powder is used in projectiles of 6-inch and lesser calibres, as a high explosive, in shells of that size, breaks them into pieces too small to cause the desired damage to the structure and machinery of a vessel.

Armor-piercing shell are usually fitted with delayed-action fuses, which will not detonate the bursting charge until it has passed through armor or had its velocity instantaneously lowered 300 or 400 feet by passing through a ship's side plating or by striking the water or some resisting object. When the bursting charge consists of black powder, no fuse is necessary, the shock and heat generated by passing through armor, even if very thin, being sufficient to insure the explosion. In the United States navy all armor-piercing projectiles are fitted with caps of the general type of that shown in the accompanying illustrations. The hollow part of the cap is added to reduce the air resistance. The solid part, which consists of soft steel, serves to support the metal of the point during the shock of entering the armor. It also slightly depresses and strains the surface it strikes; while thus strained, the surface gives way more easily to penetration. A capped projectile will penetrate hard-faced armor 10 to 25 per cent thicker than will an uncapped one.



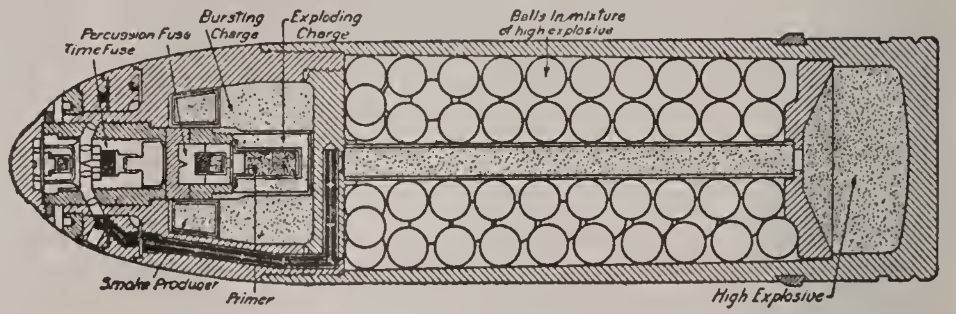
High-explosive, Armor-piercing Shell - U.S. Navy



5-inch Common Shell - U.S. Navy.

Common shell of the old type are no longer used in the United States navy in guns larger than the 5-inch, but large capacity shell are supplied with these calibres. These have bursting charges of "explosive D" and are fitted with suitable fuses. Shell of this type are useful against personnel and the unarmored parts of ships and for bombardment. For target practice, "blind" projectiles are usually employed, that is, shell where, instead of the bursting charge of high explosive, sand is used to bring the projectile to exact weight. This term is employed for unloaded projectiles.

Shrapnel shell are of forged steel and contain a large number of balls of about ½-inch diameter, or larger. The space between the balls is filled with rosin, sulphur, or a high explosive like picric acid (lyddite, melinite, etc.) or trinitrotoluol. Small charges of explosive are placed in each end of the shrapnel for the purpose of bursting it, and the tube connecting the ends also contains the same material. The rear charge assists to drive the balls forward when the projectile explodes. After explosion the balls spread out like the charge of shot from a shotgun, but the angle of the cone of dispersion is considerably greater. Time fuses (see FUSE) are fitted, and these are so constructed as to make it possible to effect explosion at any time after leaving the gun up to about 20 seconds. The time adjustment can be made in a few seconds, just before the projectile is placed in the gun. Time fuses work best in small calibres and with moderate velocities and chamber pressures (in the gun). Shrapnel is used with great effect against exposed bodies of men, light cruisers, and torpedo vessels. In the United States navy shrapnel is supplied for all guns up to and including the 4-inch, and a limited amount is furnished for the 5-inch. The normal projectile supply for field guns consists chiefly of shrapnel. See SHRAPNEL and accompanying illustration.



BRIZANZ SHRAPNEL.

Nearly all projectiles of recent design are fitted with night tracers and some with day tracers. The night tracer consists of a burning composition held in a recess in the rear of the projectile. When the gun is fired this composition ignites and discharges a small stream of fire which enables the observer to follow the flight of the projectile exactly, so that he can see whether it hits or not. Day tracers discharge smoke. Combination tracers discharge sufficient smoke by day and fire by night to effect the desired result.

When it explodes, the contents of an illuminating shell burst into bright flame and illuminate a considerable area for a few seconds. The lighting up of the object to be attacked is thus effected without necessarily disclosing the position of the gun or ship, whereas a searchlight gives constant indication of its position. Illuminating bombs are used by troops. They are usually small and fired from the ordinary musket or rifle, the bombs being attached to a stick or rod which is placed in the muzzle of the gun. Larger types are fired from small field howitzers.

Projectile fuses are of three types—time, percussion, and combination. Nearly all time fuses are fitted with percussion mechanism to cause explosion on impact, so the term "combination fuse" is tending to disappear. Time fuses are used in naval shrapnel and in field and siege guns and are fully described in the article on FUSE. Fuses for naval projectiles other than shrapnel are all of the percussion type. They are of the *ignition* class if the bursting charge is black powder and of the *detonating* class if the charge is a high explosive. The details of the new naval fuses cannot be published. They are developments of the older percussion designs in which a sliding cylinder is held in the fuse stock by a soft wire until the gun is fired. The shock of discharge breaks the wire, and the cylinder drops back to the rear of the chamber containing it. When the projectile strikes an object sufficiently resistant to stop it or instantly reduce its velocity 300 or 400 feet per second (e.g., thin plating of a ship's side), the cylinder flies forward and strikes a cap which ignites or detonates a fuse composition that in turn ignites or detonates the bursting charge. Consult: O. M. Lissak, *Ordnance and Gunnery* (New York, 1907); *Fuses* (Washington, 1914); *Naval Ordnance* (textbook at the United States Naval Academy, Annapolis, 1915); "Shrapnel and Other War Material," in *American Machinist* (New York, 1915). See AMMUNITION; BALLISTICS; EXPLOSIVES; FUSE; GUNS, NAVAL; ORDNANCE; SHRAPNEL.

PROJECTILES, MOTION OF. By this is understood the path followed by a particle of matter projected either obliquely upward or horizontally from a height above the earth's surface. The problem of predicting this path was solved by Galileo, the solution depending upon the assumption that the horizontal velocity of projection of the particle is unaffected by the vertical force of gravity which produces a constant vertical acceleration g (approximately 980 on the C.G.S. system). If the particle is projected in an oblique direction upward, which makes the angle θ with the horizon, with a velocity V, it will have a horizontal component $V\cos\theta$, and a vertical one $V\sin\theta$. The former remains unaltered; the latter is subject to a *negative* acceleration g. The particle will continue to rise until the initial vertical velocity is decreased to zero. If t is the time of ascent $gt = V\sin\theta$ or $t = V\sin\theta/g$. In this time the particle will have gone horizontally a distance $V\cos\theta \times t$ or $\frac{V^2\cos\theta\sin\theta}{g} = \frac{1}{2}\frac{V^2\sin2\theta}{g}$. After the particle reaches its highest point, it will fall and will take the same time to reach the horizontal plane through its point of projection as it did to rise to the summit of its path. In the entire time, therefore, of rising and falling, the particle will move horizontally a distance $\frac{V^2\sin2\theta}{g}$. Since the time taken to rise to its highest point was $\frac{V\sin\theta}{g}$ against an acceleration g, the height of this point is $\frac{1}{2}gt^2$, or $\frac{1}{2}\frac{V^2\sin^2\theta}{g}$. For a given value of V, the greatest distance of horizontal motion, $\frac{V^2\sin2\theta}{g}$, is when $\sin2\theta$ has its greatest value, viz., 1; for this $2\theta = 90°$, and hence $\theta = 45°$. (This conclusion is seriously modified in practice by the resisting action of the air.)

The path of the particle may be deduced: if horizontal distances are called x, and vertical ones y, then at a time t after projection

$$x = tV\cos\theta$$

$$y = tV\sin\theta - \tfrac{1}{2}gt^2.$$

If t is eliminated from these equations,

$$2y^2V\cos^2\theta = xV^2\sin2\theta - gx^2,$$

which is the equation of a parabola.

In the simplest case, when the point of projection is at a height above the surface of the earth, and the particle is projected horizontally with a velocity V,
$x = Vt$, $y = \frac{1}{2}gt^2$ where y is vertically down. Eliminating t, these equations give $y = \frac{g}{2V^2}x^2$.

As a solid moves through the air, it meets opposition of various kinds due to the air. There is an opposing force which diminishes the linear speed. For speeds less than 100 feet per second the resistance of the air varies directly as the square of the velocity, as stated by Newton. According to Duchemin (1842), this resistance $= av^2 + bv^3$ for speeds below 1370 feet per second and $= cv^2$ for higher speeds. In these expressions v is the speed of the projectile and a, b, c are factors of proportionality. The first formula has been verified by the recent work of Dr. A. F. Zahm.

If the projectile is rotating on an axis, the angular speed is decreased, owing to friction; and owing to the inequalities on the various sides, there is a sidewise *force* producing the "curves" of a baseball and the "drift" of a bullet. If the projectile is elongated or broad, the centre of pressure of the air against it and its centre of inertia are not in general in the line of motion; so there is a moment tending to make the projectile turn around an axis at right angles to the plane including the line of motion, the centre of pressure, and the centre of inertia. If the projectile is not rotating, it will turn so as to move with its broadest face front; e.g., a penny falling in water falls face down, not edge down; a sheet of cardboard falling through the air tries to fall face down. If, however, the projectile is rotating around an axis, e.g., an elongated bullet, the effect is to maintain the direction of the axis. There are other disturbing actions, also, which tend to make the axis of the rotating projectile place itself tangent to the trajectory. See BALLISTICS; DRIFT OF A PERSPECTIVE.

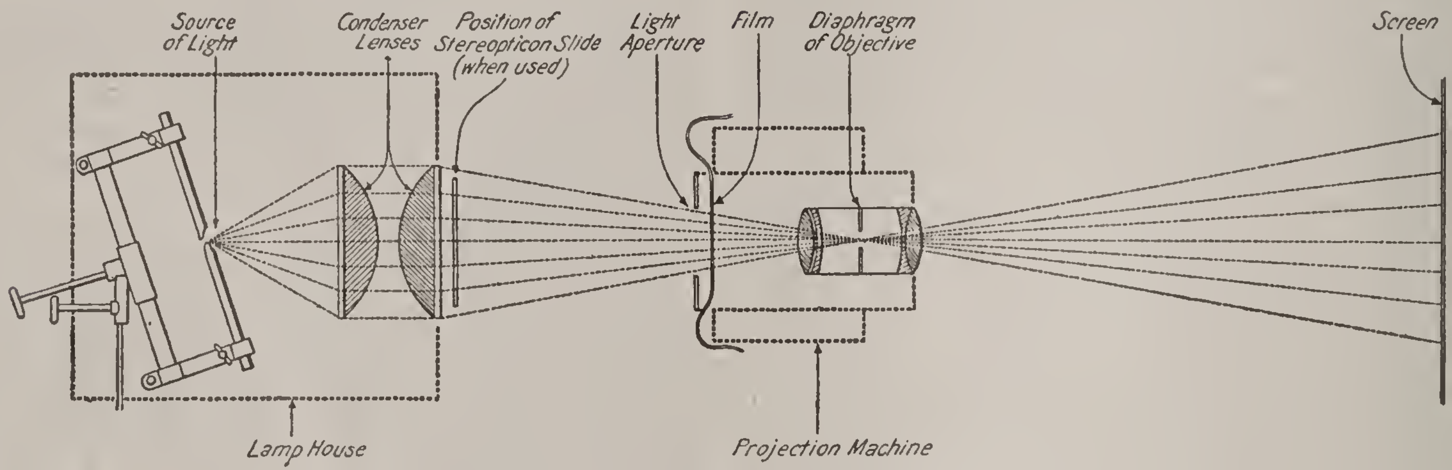
PROJEC'TION (Lat. *projectio*, from *projicere*, to throw forward). The act or result of constructing a figure upon a given surface, usually by means of a pencil of rays, so that it corresponds point by point to another given figure. It thus includes perspective (q.v.) and is most simply illustrated by the shadow of an object thrown by a light on a wall, the shadow being the projection, and the light being the vertex of the pencil or sheaf of rays. If the centre of projection is infinitely distant, the projection is called *parallel* projection; if also the projection rays are perpendicular to the plans of projection, we have *orthogonal* projection. The theory of projections is of great importance, both in mathematics and in geography, being in the former case general in its application, while in the latter only the projection of the sphere is required. Projections of the sphere are of various kinds, all of which are treated under MAP.

In mathematics the theory of projections has reached a high degree of perfection, serving to generalize the ancient geometry. (See GEOMETRY.) Its basis is the investigation and determination of those properties which, being true of a figure, are also true of its projections, such properties being necessarily dependent, not on the *magnitude*, but on the *position* of the lines and angles belonging to the figure. These properties are generally called *projective* properties. For instance, the three conic sections (q.v.), the parabola, ellipse, and hyperbola, are merely various projections of a circle on a plane, and all *positional* properties of the circle are at once, by this theory, connected with similar properties of the three conic sections. The introduction of coördinates has extended the applications of the subject, and it is now employed in solving the problems of applied mathematics.

For the use of projection in mechanics, consult: S. D. Poisson, *Traité de mécanique* (2d ed., 2 vols., Paris, 1833); S. E. Warren, *Elementary Projection Drawing* (10th ed., New York, 1887); Stade and Seidel, *Das Wichtigste aus dem geometrischen Zeichnen und der Projektionslehre* (Leipzig, 1894); Church and Bartlett, in *Elements of Descriptive Geometry*, part i (New York, 1911).

PROJECTION, ISOMETRIC. See ISOMETRIC PERSPECTIVE.

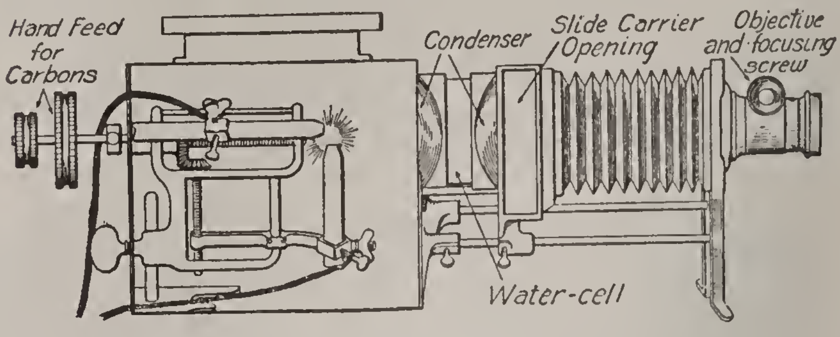
PROJECTION APPARATUS. A device or apparatus for exhibiting enlarged images of transparent or opaque objects so as to render them visible in a darkened room or hall to a large number of persons. It comprises a source of light, usually an electric arc, two sets of lenses, and one or more mirrors. The most familiar projection apparatus is the magic lantern or stereopticon for showing stationary pictures called slides and moving films for motion pictures. In addition arrangements for concentrating an intense light, either white or colored, on the stage of a theatre and for projecting light to a great distance, as in military or naval service, will fall in the same category. The great variety of purposes for which projection apparatus is employed has given rise to many special names descriptive of the particular use to which any device is put. In general the terms "stereopticon," "projectoscope," "reflectoscope," "balopticon," and "delineascope" refer to a lantern device which projects the image of transparent or opaque objects.



PRINCIPLE OF OPTICAL PROJECTION.

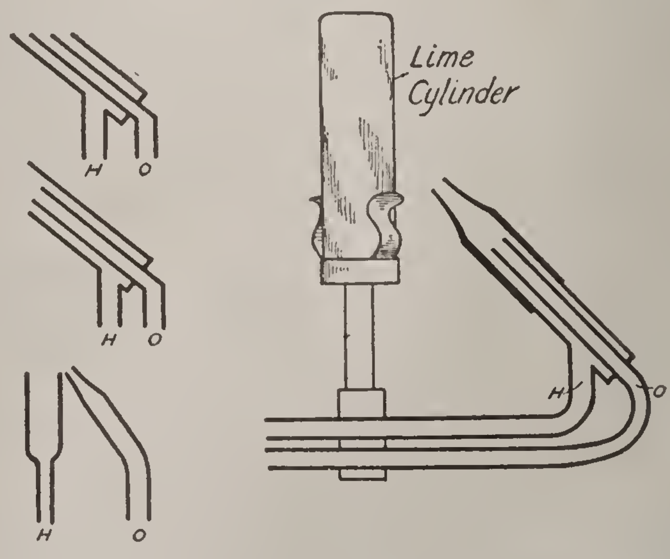
General Description. As shown in the illustration the rays from the illuminant fall upon a lens combination called a condenser, which is either a single, thick, convex lens or, as commonly made, comprises two plano-convex lenses with their curved faces placed closely adjacent. The purpose of the condenser is to collect the luminous rays and transmit them as a parallel or slightly convergent beam to illuminate the slide or film, an enlarged image of which is to be formed on a white wall or screen facing the apparatus. To produce this image another set of lenses termed the objective is placed in front of the slide or film. This lens system must be achromatic (see ACHROMATISM) and free from distortion, so as to form a perfectly flat field. By varying the distance between the slide or film and the objective, or, in other words, one of the conjugate foci, the image on the screen is made to appear sharp and distinct as the appropriate focal distance is obtained. Lenses now obtainable are so carefully ground and corrected as to combine great sharpness of detail with a high degree of magnification.

In order to prevent cracking of the glass lantern slides by heat concentrated by the condenser, a glass cell or container with parallel sides and filled with water is placed between the two elements of the condenser, as shown. Projection lanterns usually have the arc-lamp carbons arranged at right angles to each other, as shown in the diagram, for the reason that the positive crater, which is the area of greatest brightness, is more readily centred in the optic axis of the lens system. A rheostat for regulating the amount of current in the arc-lamp circuit is an integral part of an electric lantern outfit.



LANTERN OR STEREOPTICON, SHOWING PRINCIPAL PARTS.

Illuminants. While for lecture purposes on certain topics it is advantageous to employ sunlight, its irregularity and the necessity of installing a heliostat (q.v.) make it an inconvenient and troublesome illuminant. In small rooms where the degree of magnification need not be great, a double-flame or triple-flame kerosene lantern may be used, although a Welsbach mantle or an acetylene-gas flame furnishes a brighter radiant. In localities where electricity is not available, the limelight or oxyhydrogen flame directed upon a piece of lime is an excellent substitute for the electric arc. If it were necessary it might be employed even for moving-picture projection. The electric arc is the most



TYPES OF BLOW-THROUGH NOZZLES FOR USE WITH OXY-HYDROGEN BURNER.

Position of burner in front of lime also shown.

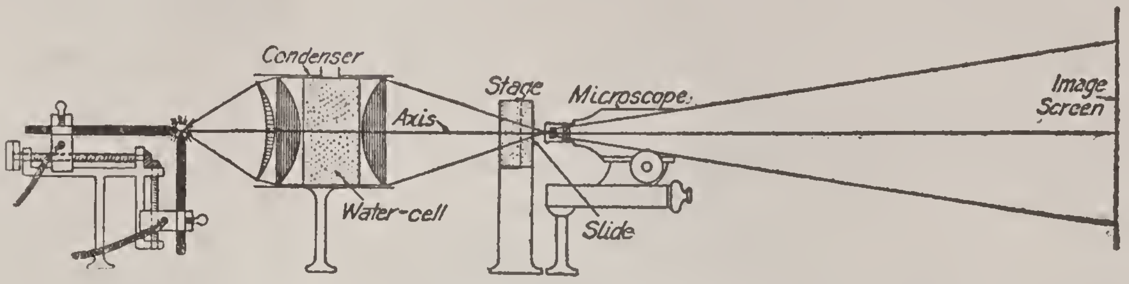
powerful, convenient, and satisfactory radiant for projection purposes. The gas-filled incandescent lamp is often used, but is not bright enough for a large hall, involving large magnification. Either alternating or direct current may be employed for arc lamps, but the latter gives better results for picture projection because of the great brilliancy of the crater of the positive electrode and the facility with which it may be kept in the optic axis of the lenses. Where direct current is not available an alternating-current arc may be employed with a fair degree of satisfaction, but it is usually noisy, emitting a humming sound, and consumes more energy than the direct-current arc for the same degree of illumination.

Slides. The transparent glass pictures used in modern stereopticons and similar projection devices are called slides. Formerly pictures painted or drawn on glass were used in magic lanterns. The present-day slides are photographic positives, which may or may not be colored by hand. In the United States the size adopted is 3¼ inches high and 4 inches wide, while in England the standard is a square, 3¼ × 3¼ inches. Since the image of any object placed in front of the condensing lens is inverted as well as reversed in a horizontal direction, lantern slides must be marked with an unmistakable label to insure that the operator will put them in the slide carrier so as to project the picture in its proper position. This mark is located by looking at the slide when holding it so that the picture on it appears correct and just as its magnified image must appear on the screen. It is affixed to the lower left-hand corner. When the slide is put in the carrier the mark must occupy the upper right-hand corner of that side facing the condenser. Colored slides were formerly extensively employed in lectures, and required considerable skill on the part of the artist. For motion pictures the Kinemacolor (q.v.) process gives quite satisfactory results, but has not become widely popular.

Screen. For distinct and satisfactory picture projection a screen must be used that can be stretched flat without wrinkles. A smooth plastered wall, dead white or tinted, is even better, and this is to be found in the best-arranged lecture halls, as in large museums. The size of the exhibition hall or room determines the distance between lantern and screen and consequently the degree of magnification to be secured; but as the size of the projected image is increased corresponding attention must be paid to the focusing of the details of the picture.

Stereopticon. This term is often applied to a pair of magic lanterns so arranged as to focus their pictures on the same portion of the screen so as to cause the picture projected by one to merge or dissolve into the other. This may be accomplished by mechanically connecting the iris-diaphragm shutters of the two lanterns or some similar intercepting device so that one picture comes gradually into view simultaneously with the fading away of the other. The illusion of rain, snow, or lightning may be produced in a picture by employing two lanterns. Two lanterns may be used for the projection, and this device can be employed in the back drop of a stage setting of stereoscopic pictures. See DISSOLVING VIEWS; STEREOSCOPE.

Microscopic Projection. Specimens or slides prepared for the microscope (q.v.) may be well shown for lecture purposes by a lantern whose objective-lens system is replaced by a microscope objective of moderate magnifying power. Photographs of such objects are made by using a low-power objective and a camera provided with a suitable extension-bellows arrangement.



ARRANGEMENT OF LANTERN FOR PROJECTION OF MICROSCOPE SLIDES.

Moving Pictures. For the projection of moving pictures the optical arrangement is essentially the same as for ordinary lantern slides, but as the aperture of the moving-picture machine is so much smaller than the slide, the moving film must be arranged farther away from the condenser to intercept the same quantity of light. See MOVING PICTURES.

Opaque Objects. The so-called projectoscope is arranged so that it may be used either for the projection of transparent lantern slides of the usual kind, microscopic specimens, or opaque objects. In the space between the condensing and projection lenses, on the floor of the lamp house, is placed an opaque object, such as a post card, whose magnified image is to be displayed. For illuminating this the lamp house containing the arc lamp and the condenser is arranged so as to be inclined at an angle of 45° with the horizontal. At the top of the lamp house an additional projecting objective is arranged. This differs from the projecting objective for use with a lantern slide in that it is much larger and has a wider angle of aperture so as to permit the transmission of the maximum amount of light. Directly above this vertical objective is a plane mirror adjusted at 45° inclination, so that the light from the lantern reflected from the object on the floor of the lamp house, thence through the objec-

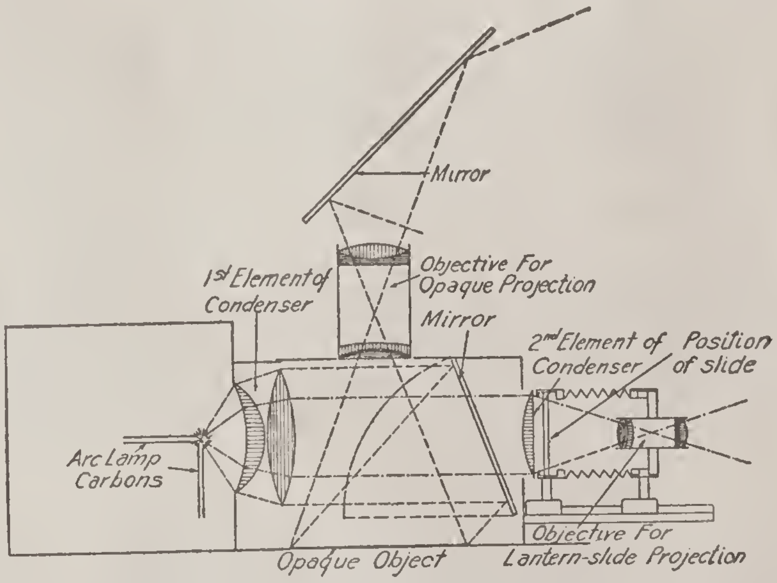


DIAGRAM OF PROJECTOSCOPE FOR PROJECTING IMAGES OF OPAQUE OBJECTS.

When used for lantern-slide projection the mirror shown between the two lenses of the condenser is turned down to a horizontal position.

tive, is reflected from the plane mirror to the screen, where it is observed as a magnified image in an erect position. Several modifications of this form of projectoscope are made, some of them being particularly adapted for the display of microscopic specimens and having the lenses adapted therefor as regards size and focal length. A further use for devices of this kind is for making drawings of microscopic specimens on a large scale. By a suitably arranged system of mirrors the light from the object to be drawn is reflected twice, so as to be received on a horizontal surface, usually a drawing board, on which the artist may trace at will the outline as well as color any desired portion of the work.

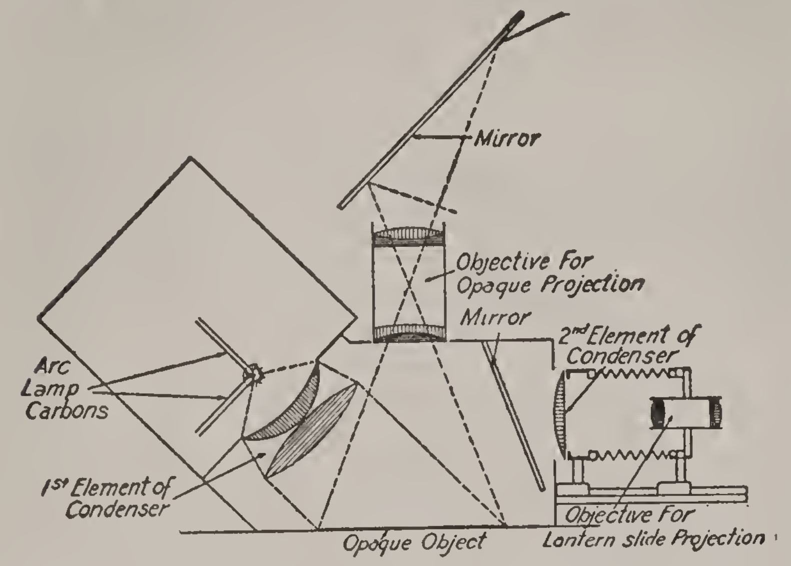
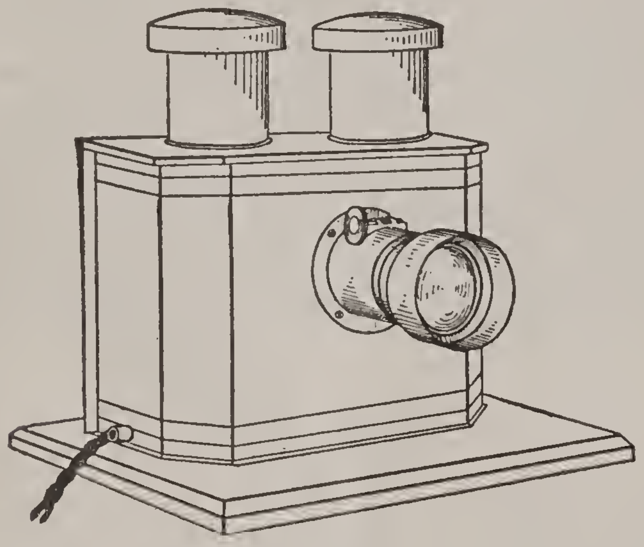


DIAGRAM OF PROJECTOSCOPE WITH LAMP HOUSE INCLINED SO AS TO ILLUMINATE THE OPAQUE OBJECT TO THE MAXIMUM DEGREE.



POST-CARD PROJECTOR; ALSO CALLED BALOPTICON.

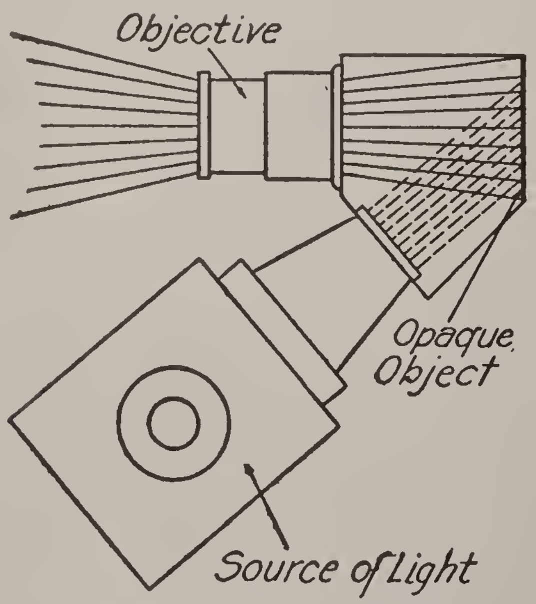


DIAGRAM OF POST-CARD PROJECTOR WITH ONE LAMP.

For the enlarged representation of colored as well as black and white post cards and other opaque objects, a lantern is sometimes used in which the light directed from two arc or incandescent lamps is focused upon the object and reflected from it to an objective of the usual type. This gives fair results, especially in small apparatus for home demonstrations, though the brightness of the image on the screen is less than that made by transparent positives used in the ordinary magic lantern, owing to the fact that opaque objects can reflect so small a proportion of the light incident upon them. It is for this reason that two lanterns often are employed in devices of this kind.

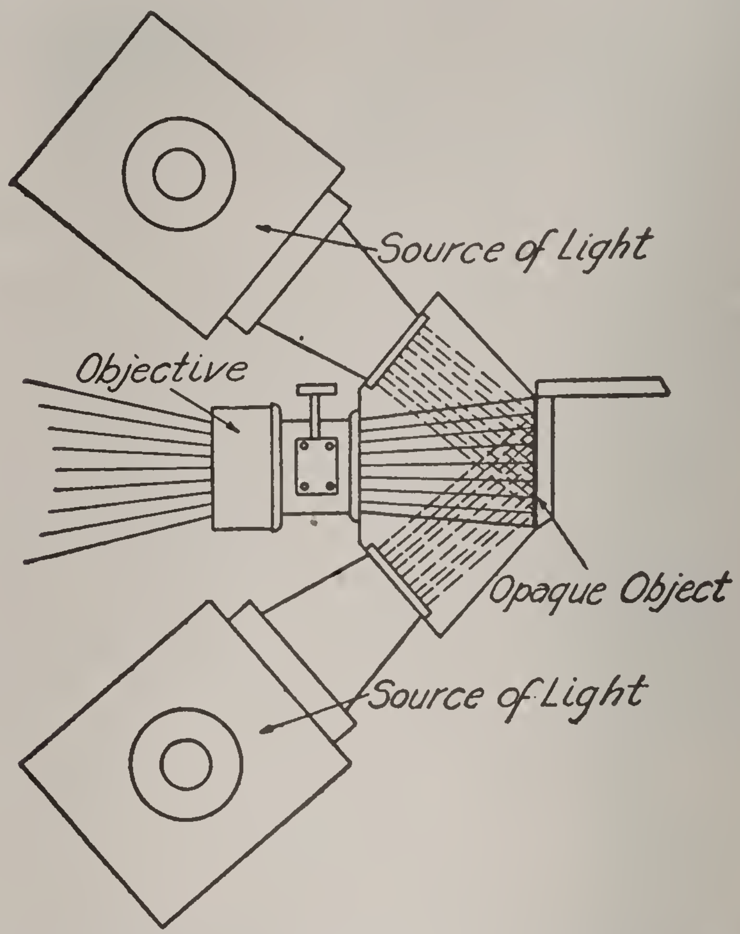


DIAGRAM OF POST-CARD PROJECTOR WITH TWO LAMPS, FOR BRIGHTER ILLUMINATION OF THE SCREEN.

Spotlights. These include arc lamps provided with hemispherical or parabolic reflectors and sets of colored glass screens that may be put in the path of the projected radiations for use in theatres for the purpose of concentrating an intense white or colored light on dancers or actors, following them in their movements about the stage. In some cases an arrangement of lenses similar to that of the magic lantern to concentrate the light is employed on a movable mounting.

Searchlights. There are several types of arc lamp in use for searchlight projection. The optical conditions to be fulfilled are somewhat different from those above described, as the maximum amount of light must be concentrated in a beam of parallel rays and projected as far as atmospheric conditions, etc., will permit; while picture projection requires the convergence of the luminous radiations to illuminate the slide or film picture, whose magnified image is then formed on the screen at a comparatively short distance. See SEARCHLIGHT.

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raphy (London, 1911); F. A. Talbot, *Moving Pictures* (Philadelphia, 1912); S. H. and H. P. Gage, *Optic Projection* (Ithaca, N. Y., 1914). See MOVING PICTURES.

PROJEC′TIVE GEOMETRY. A geometry in which the properties and relations are investigated by means of the theory of projections.

PROJECT′OSCOPE. See PROJECTION APPARATUS.

PROKESCH-OSTEN, prō′kĕsh-ōs′ten, ANTON, COUNT (1795–1876). An Austrian diplomat and author, born at Graz. He entered the Austrian army, served in the French campaign in 1813–15, was made professor in the military school of Olmütz (1816), and, after serving as adjutant to Prince Schwarzenberg (whose memoirs he published in 1822), was sent on diplomatic missions to the East. In Greece and Syria he was very successful, and for his services in bringing about the Treaty of 1829 with the Pasha of Akka, whereby Christians were granted many privileges in Palestine, he was ennobled (1830). In 1831 Prokesch-Osten was chief of staff in the Austrian army sent to Bologna, and he was Minister to Athens (1834–49), and to Berlin (1849–52), Ambassador to the Frankfurt Parliament (1853–54), and from 1855 to 1871 represented Austria at Constantinople, with the title of Ambassador after 1867. He retired in 1871. He was made Baron in 1845 and Count in 1871. His more important works are: *Erinnerungen aus Aegypten und Kleinasien* (1829–31); *Geschichte des Abfalls der Griechen vom türkischen Reich* (1821); *Kleine Schriften* (7 vols., 1842–44).

PROKOP. See PROCOPIUS.

PROLAP′SUS A′NI (Lat., falling of the anus). An affection of the terminal portion of the intestinal canal which consists in a protrusion of the mucous membrane of the lower part of the rectum through the anal orifice. When the protrusion includes the whole thickness of the rectal wall, the condition is known as *prolapsus recti.* These conditions may depend on a naturally relaxed condition of the parts, such as exists in infancy, or they may be brought about by violent straining at stool. Whenever prolapse occurs, the parts should be washed and, if possible, replaced by careful pressure with the fingers; and if they do not easily return, the forefinger should be oiled and pushed up into the anus, when it will convey the protruded intestine with it, after which the patient should maintain the recumbent posture for some hours. If the protrusion cannot be returned by such means, surgical assistance should be at once sought. In order to obviate the tendency to prolapse the patient should regulate the bowels so as to avoid constipation and should sponge the parts, after each evacuation, with cold water. A firm pad is sometimes required to prevent recurrence. Where the trouble persists it may be necessary for the surgeon to remove part of the redundant mucous membrane by the knife or cautery, or, in severe cases, to resect a portion of the rectal wall.

PROLAP′SUS U′TERI (Lat., falling of the womb). The condition in which the womb falls below its natural position in the pelvic cavity and approaches the outlet of the vagina. If the womb appears outside, it is known as *procidentia*, or complete prolapse. Thus all degrees of prolapse are observed, from a very slight depression to a complete extrusion, and in its descent not only does the womb itself fall, but it drags with it the vaginal walls, usually a part of the bladder, and less frequently the rectum. The prolapsed portion of the bladder is known as a *cystocele*, that of the rectum as *rectocele.* Prolapse of the uterus is a very common affection, occurring most frequently in women past middle age as a consequence of lacerations of the pelvic floor during childbirth; but it is found in unmarried women also and rarely in children. The symptoms of this affection arise partly from the pressure of the womb on other organs, partly from the simultaneous displacement of adjacent parts (as the bladder, rectum, etc.), and partly from reflex action. Patients with only a slight displacement usually complain of a sensation of fullness in the pelvis, of weight and bearing down, of dragging pain in the back, these symptoms being aggravated when the upright position is assumed. The treatment varies with the degree of displacement. In cases of complete prolapse the uterus should be replaced and retained in position if possible by mechanical means, such as tampons of cotton or pessaries or rings. In extreme cases removal of the entire organ may be necessary to afford relief. In cases of moderate severity great improvement is further secured by increasing the general tone of the tissues by tonics and constitutional treatment and by douches and other forms of local applications. The improvement in the general health is of great importance. In many instances an operation is necessary for the repair of the lacerated tissues at the pelvic outlet. Where neglected, the condition has a tendency to become aggravated, and rectal and bladder symptoms make themselves evident.

PROLÉTAIRES, prō̇′lȧ′târ′ (Fr. *prolétaire*, from Lat. *proletarius*, one of the lowest class of Roman citizens, regarded as of value to the state only on account of their offspring, from *proles*, progeny), or PROLETARIAT. That part of the wage-earning class who are entirely dependent on their daily labor for their livelihood. See SOCIALISM.

PRO′LOGUE (OF., Fr. *prologue*, from Lat. *prologus*, from Gk. *πρόλογος*, preface, introduction, from *πρό*, *pro*, before + *λόγος*, *logos*, speech, word, reason, ratio). In ancient Greek drama, that part of a play (whether an acted scene or an exclamatory speech) which came before the entrance of the chorus. Thus, the prologue in the *Œdipus* of Sophocles is a scene in which appear Œdipus, the high priest of Zeus, and Creon, whereas the prologue to the *Agamemnon* of Æschylus is only the monologue of the watchman on the tower. At least from the time of Euripides the prologue became a speech explanatory of the situation to be developed, and it continued to be such in Latin comedy. With Plautus and Terence the prologue was divorced from the main body of the drama. In the early English drama the duties of setting forth the theme were shared by the induction, or prologue, and the chorus. When the induction was falling into decay, the prologue or chorus supplied or assisted the argument. Their double employment is exemplified in *Hamlet* in the play scene. When the prologue enters, Hamlet says: "We shall know by this fellow; the players cannot keep counsel; they'll tell all." Hamlet explains to Ophelia the relationship of Lucianus and the King, and Ophelia responds, "You are as good as a chorus, my lord." In *Henry the Fifth* a prologue, called "chorus," precedes each act, to prepare the audience for the shifting scenes. For other plays Shakespeare wrote no prologue, but in the first scenes he both explained and developed the situation. After the Restoration (1660) a play was hardly complete without its prologue and epilogue. Even in Dryden's time the prologue served as a subject for literary wrangling as often almost as it served any dramatic purpose. Modern plays, save for quaintness' sake, never have a prologue. On the other hand, the playwright is bound to set forth in the first scene the problem or theme to be handled in his play. Thus, we observe something like a steady degeneration of the prologue in proportion as the playwright begins more and more to make the main body of his drama a unit of thought and action. Consult G. S. B., *The Prologue and Epilogue in English Literature from Shakespeare to Dryden* (London, 1884). Taken over into oratory, the word "prologue" is also applied to the opening of a speech; and it is now loosely applied—and indeed was sometimes so applied by the Greeks—to any prefatory statement to poem, discourse, or play. See EPILOGUE.

PRÖLSS, prēls, JOHANNES (1853–1911). A German novelist, son of Robert Prölss. He was born in Dresden, studied at Jena and Leipzig, was literary editor of the *Frankfurter Zeitung* (1880–89), of the *Stuttgarter Union* (1890 et seq.), and from 1894 to 1903 also of the *Gartenlaube.* He wrote: *Emancipierte Novellen* (1880); *Modelle* (1891); *Das junge Deutschland* (1892); *Bilderstürmer!* (1895); *Die schönste Frau* (1904); and of a historical nature, *Friedrich der Stolze und Frankfurt am Main* (1905).

PRÖLSS, ROBERT (1821–1906). A German dramatist and critic of the drama, born in Dresden. After 1863 he devoted himself wholly to literature. In 1847 he wrote *Das Recht der Liebe,* a comedy. His later plays were the tragedies *Sophonisbe* (1862), *Michael Kohlhaas* (1863), and *Katharina Howard* (1865), and the comedies *Eine edle That* and *Die verdächtige Wahrheit,* after Alarcón. His critical and historical essays, of more importance, include: *Erläuterungen zu Shakespeares Dramen* (1874–89); *Das Meiningensche Hoftheater und die Bühnenreform* (1876); *Katechismus der Dramaturgie* (1877; 2d ed., 1899); *Geschichte des Hoftheaters zu Dresden* (1877); versions of Marlowe, Webster, and Massinger (1880); a life of *Heine* (1886); *Kurzgefasste Geschichte der deutschen Schauspielkunst* (1900).

PROME, prōm. The capital of a district in Burma, British India, at the confluence of the Nawin with the Irrawaddy, 113 miles northwest of Pegu (Map: Burma, C 3). On account of the flatness of the ground on which it stands the town is often inundated from the Irrawaddy. The chief native building is the Shwesandau Pagoda, 180 feet high, surrounded by 83 small gilded temples. It is visited by thousands of Buddhist pilgrims on the occasion of each annual festival in March. The European buildings include the government offices, law courts, the Jubilee Clock Tower, and the Anglican Church; the public gardens and the markets are also notable features. The town, which is the terminus of a railroad from Rangoon, has many advantages for trade. In the adjacent country are extensive gardens and rice grounds, and there are important manufactures of paper, silk, cotton, sugar, and gold lacquer ware. Pop., 1901, 27,375; 1911, 25,784. Prome dates from before the Christian era, when it was the capital of a powerful kingdom. The town was taken by the British in 1825 and in 1852. In 1862 it was almost wholly destroyed by fire.

PROMESSI SPOSI, prō-mĕ′sē spō′zē, I (It., The Betrothed). A novel by Alessandro Manzoni (1825), so admirable that it has become a classic and has been translated into many languages.

PROME′THEA (Neo-Lat., from Lat. *Prometheus,* name of a giant). One of the commonest of the large North American silkworm moths (*Callosamia promethea*). The female is reddish brown with white, black, and gray markings. The wings of the male differ both in shape and coloration from those of the female and are blackish, with the markings characteristic of the female very faint or wholly absent. The fully grown larva is 2 inches or more in length, bluish green, and armed by large black tubercles in addition to four coral-red ones in the thoracic region and one yellow one on the abdomen. The larvæ feed preferably on the wild cherry and ash, but are also found on a great variety of trees and shrubs. The cocoon is elongated and inclosed in a leaf, which is attached to a twig by strands of silk and is thus prevented from falling in the autumn. Although the cocoon resembles very closely that of the ailanthus silkworm (larva of *Philosamia cynthia*), which has some slight market value, it has never been commercially used.

PROME′THEUS (Lat., from Gk. *Προμηθεύς*, from *προμηθής*, *promēthēs*, foresighted, from *πρό*, before + *μῆτις*, *mētis*, wisdom; connected with *μαθεῖν*, *mathein*, to learn; less probably connected with Skt. *pramantha*, fire drill, from *pra*, before + *mantha*, churning, from *math*, to whirl, churn, produce fire by friction). The hero of one of the most interesting of the Greek myths. The story goes back to a very early period and in its origin may be compared with the many similar legends as to the origin of fire, usually by a theft from the sun or the gods, or as the beneficent gift of some kindly animal or great hero. In this character as the fire-bringing god (*ὁ πυρφόρος θεός*, *ho pyrphoros theos*) Prometheus had an altar in the Academy at Athens, where he was joined with Hephæstus and Athena, as those who had given to men the arts and crafts that brought civilization. He was honored with a special festival, of which the chief feature was a torch race from his altar in the Academy to the city. In Hesiod Prometheus is a Titan, son of Iapetus and Clymene, brother of Atlas, Menœtius, and Epimetheus. Angry at a trick played on him by Prometheus, Zeus deprived men of fire, but Prometheus stole it from the hearth of Zeus, hid it in the pith of a fennel stalk, and conveyed it to earth. In punishment Zeus sent Pandora (q.v.) to Epimetheus and bestowed thus upon men the race of women, "who dwell as a great plague among mortal men." Prometheus himself was fettered to a column and visited daily by an eagle who devoured his liver, which always grew again during the night, so that his torment was unceasing till Hercules came and by the good will of Zeus, who thus gave greater glory to his son, slew the eagle and freed Prometheus. In this version the Titan really works men harm in his efforts to overcome by trickery the high designs of Zeus. It should also be noted that the myth of Pandora seems to be originally a separate legend of the origin of suffering and woe, only later connected with the theft of fire. This primitive myth was reworked by the Athenian tragedian Æschylus in his Promethean trilogy, of which the *Prometheus Bound* has survived, and was brought more into harmony with the Athenian cult and the conceptions of a later time. Here Prometheus is the son of Themis (whom the poet identifies with Gæa, the earth) and through her possesses the gift of foreknowledge and prophecy. He thus foresees the ultimate triumph of intelligence over brute force in the struggle between Zeus and the Titans and consequently joins the winning side. When, however, Zeus, as the establisher of a rule of law and order, plans to replace the wretched race of men by a nobler order of beings, Prometheus in pity defeats this design by stealing fire and instructing men in all the useful arts, so that there now exists no ground for Zeus to remove them from the earth. For this rebellion Hephæstus is required to nail Prometheus to a lonely cliff in Scythia near the ocean. Here the extant play, *Prometheus Bound*, shows him still defiant, execrating the ingratitude and cruelty of Zeus, who can thus punish an ally whose only fault is a desire to benefit mankind, and at the same time exulting in the secret knowledge that the violence of Zeus to his father, Cronos (see SATURN), unless atoned for, must be punished. His threats and defiance rise to such a pitch that Zeus casts him into Tartarus.

The play seems to represent Prometheus as a martyr and Zeus as a cruel tyrant, but closer examination shows that Zeus is bound to punish the rebel who has tried to overthrow the new reign of law. The later dramas of Æschylus' trilogy seem to have made this conception clear. Zeus was reconciled to Cronos and the Titans, and Prometheus was brought to yield to the now secure Zeus. Hercules by the will of the god slew the eagle and freed the prisoner, in whose stead the centaur Chiron (q.v.), suffering from an incurable wound, surrendered his immortality and descended to the regions of the dead. The closing drama seems to have related the establishment of the worship of Prometheus at Athens. In the later versions, especially on the sarcophagi, besides minor variations, we find Prometheus represented as the actual creator of men, whom he fashions out of clay, and at whose death he is sunk in sorrow and meditation. The whole myth in its origin and signification, and especially in its treatment by Æschylus, has been the subject of lengthy discussion and has produced an extensive literature, much of which is to be found in editions of the *Prometheus Bound.*

Bibliography. Welcker, *Die Aeschyläische Trilogie Prometheus*, and *Nachtrag* (Darmstadt, 1824, 1826); Hermann, "De Æschyli Prometheo Soluto," in his *Opuscula*, vol. iv (Leipzig, 1831); these two works developed a great controversy and have historical interest. Also: Wecklein, *Prometheus Bound of Æschylus*, translated by F. D. Allen (Boston, 1891), and Preller-Robert, *Griechische Mythologie I.* (Leipzig, 1887); C. M. Gayley, *The Classic Myths in English Literature and in Art* (2d ed., Boston, 1911); the articles "Promethus," in W. H. Roscher, *Lexikon der griechischen und römischen Mythologie*, vol. iii (Leipzig, 1897–1909), and in Fr. Lübker, *Reallexikon des klassischen Altertums*, vol. ii (8th ed., ib., 1914). The play has been translated by Mrs. Browning. On works of art consult: Otto Jahn, "Prométhée," in *Annali dell' Istituto*, vol. xix (Rome, 1847), and "Ueber ein Sarcophagrelief im Museo Borbonico," in *Berichte der sächsischen Gesellschaft der Wissenschaften* (Leipzig, 1849); Milchhöfer, *Die Befreiung des Prometheus, Berliner Winckelmannsprogramm*, 42 (Berlin, 1882); A. Baumeister, in *Denkmäler des klassischen Altertums* (Munich, 1888); and pages 116–120 of J. E. Harry's edition of the *Prometheus Bound* (New York, 1905).

PROMETHEUS UNBOUND. A lyrical drama by Percy Bysshe Shelley (1820). Though founded on Æschylus' tragedy, it is not Greek in form or spirit. In this poem Shelley (stirred by the spirit of the French Revolution) exults in the deliverance of humanity.

PROM'ISSORY NOTE (from Lat. *promissor*, promiser, from *promittere*, to promise, send forward, from *pro*, before, for + *mittere*, to send, Skt. *miv*, to push). A written instrument containing an express and unconditional promise by the maker to pay a certain sum in money, on demand, or at a fixed or determinable future time. If it is payable to the order of the payee or to bearer, it is a negotiable instrument, i.e., not only transferable to another, with or without consideration, but, if taken in due course before maturity and without notice of defenses which the maker may have against the payee, absolutely enforceable by the transferee. The following is an ordinary form of a negotiable promissory note, payable at a bank:

"$1000.00 New York, April 1, 1907.

Three months after date I promise to pay to the order of Richard Roe One Thousand Dollars, at the First National Bank.

Value received. JOHN DOE."

If the payee is named, as in the form given above, and the note is payable to his order, his indorsement of it is necessary to its negotiation. He may sell and transfer it without an indorsement; but his transferee in that case will take it subject to any defenses available to the maker against him. The maker promises absolutely to pay the paper. Hence the holder is not bound to present it at the time and place named in the instrument, as a condition of suing the maker.

The early history of promissory notes is obscure. Their earliest appearance in the reported decisions of English courts is towards the close of the seventeenth century. For a time the judges seemed disposed to follow mercantile usage and to treat them as negotiable instruments. With the accession of Lord Holt to the chief justiceship of the King's Bench, a change of judicial attitude became noticeable. He refused to recognize their negotiable character, and in 1704 Parliament, siding with the merchants, enacted a statute (3 and 4 Anne, c. 9) which declared that promissory notes "shall have the same effect as inland bills of exchange." This has ever since been the law in England and the United States.

In some States certain forms of notes are declared negotiable by statute which are not negotiable at common law. For further discussion and for the liability of indorsers, requirements as to presentation, etc., consult M. M. Bigelow, *Cases on Law of Bills, Notes and Cheques* (2d ed., Boston, 1905), and the authorities referred to under NEGOTIABLE INSTRUMENTS.

See Bill of Exchange; Demand; Indorsement; Negotiable Instruments; Protest.

PROM′ONTO′RIUM AROM′ATUM. See Guardafui, Cape.

PROMONTORIUM BOLE′RIUM. See Land's End.

PROMONTORIUM LACIN′IUM. See Lacinian Promontorium.

PROMONTORIUM LILYBÆUM. See Lilybæum Promontorium.

PROMONTORIUM NE′RUM. See Cape Finisterre.

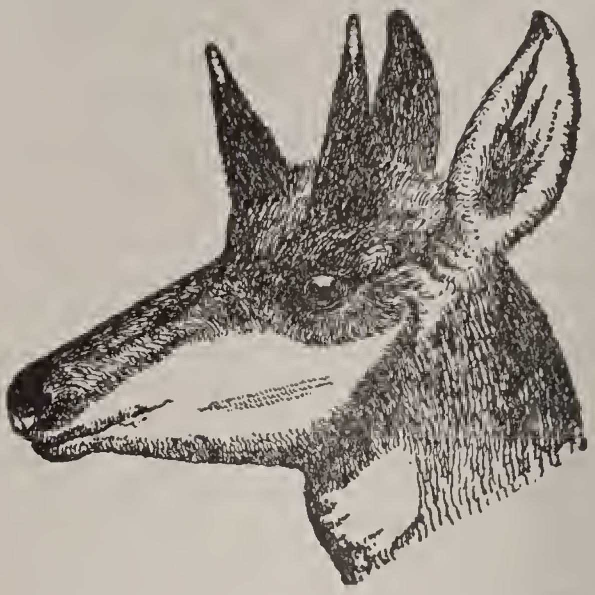
PRO′MORPHOL′OGY (from Gk. *πρό*, *pro*, before + *μορφή*, *morphē*, form + *-λογία*, *-logia*, account, from *λέγειν*, *legein*, to say). The study of the simplest of the fundamental forms of organisms. While the simplest plants and animals as well as eggs and seeds are, as the result of the action of gravity, more or less spherical, in other types we are reminded of the forms of crystals, though there is wanting the mathematical regularity and symmetry present in crystalline forms. In the most symmetrical animals certain internal organs are unsymmetrical in relation to the body. See Symmetry.

PROMO′TER (ML. *promoter*, from Lat. *promovere*, to promote, push forward, from *pro*, before, for + *movere*, to move, Skt. *mīv*, to push). One who urges or assists in the organization of a corporation or joint-stock company. A promoter commonly makes the plans for the business operations to be carried on, estimates the probable profits, solicits subscriptions to the stock of the proposed corporation, and, in short, does all he can to bring about its organization. A promoter is held to stand in a fiduciary relation to the company formed by him. Accordingly he is held to a very strict accountability for his representations to investors. Unless he discloses to the subscribers for stock the amount of profits he intends to make by effecting the organization, or by selling the company any lands or things of value, he must account to them for what he receives. If a promoter make fraudulent misrepresentations as to the prospects of the corporation, any subscriber deceived thereby may cancel his subscription, and may recover from the promoter any damages sustained by reason thereof. If a person urges others to form a company and buy something he has to sell, and does not himself become identified with the organization, he is not a promoter in the above sense, and may lawfully obtain the best price he can induce the company to pay for his property. A promoter acting in his own behalf is not an agent of the subscribers or of the resulting corporation, and accordingly the corporation, when organized, is not liable for any contracts entered into on its behalf by the promoter prior to its organization. A promoter may, however, sometimes be held personally liable on such contracts. See Thompson, *On Liability of Directors and Other Officers and Agents of Corporations* (St. Louis, 1880); and consult the authorities referred to under Agent; Contract; Corporation.

PROMO′TION. See Rank and Command.

PRONA′OS (Lat., from Gk. *πρόναος*, porch before a temple, from *πρό*, *pro*, before + *νάος*, *naos*, temple). The vestibule in front of the naos or cella of a temple. It is commonly a portico or colonnade formed by prolonging the side walls of the cella. See Greek Art, *The Temple*.

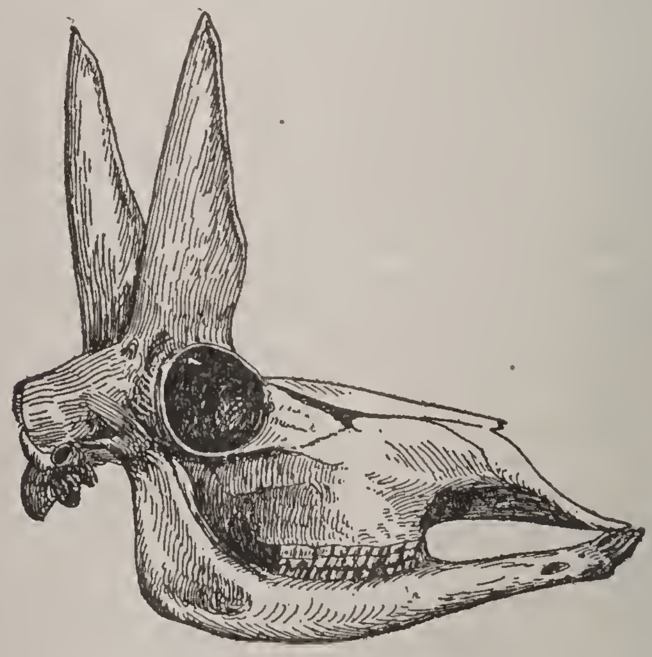
PRONG′HORN. The goat-antelope (*Antilocapra americana*) of the plains of western North America, generally known as antelope and by the Canadian French as cabree (*cabrit*). It ranged from the Missouri River to the Pacific coast and from the Saskatchewan River to the interior of Mexico, most commonly on open plains or in broad valleys. It is not nearly so abundant now as formerly, but it is still plentiful in the less thickly settled parts of the West.



HEAD OF A PRONGHORN.

Showing the early change from hairy skin to horn at the tips of the young horns.

The pronghorn is about 4½ feet long and 3 feet high. It is yellowish brown above and white below; there are brown and white markings on the head, and the white buttocks are said to gleam in the sun at a long distance. The shape of the body is deerlike, but more robust; the head is carried erect, while the bounding gait and alert air are gazelle-like. (See Colored Plate of Antelopes.) The animal differs from the true antelopes and from all other ruminants in the total absence of false hoofs and in the remarkable nature of its horns, which are deciduous. The skull is surmounted by two spikelike horn cores, rising over the great eye orbit and leaning outward. These are covered with a skin and coat of bristly hairs which agglutinate at the tip and change into a compressed horny sheath, the change proceeding towards the base until the whole is sheathed with horn. These stand about a foot in height, are curved inward, often so as to be truly lyrate, and, unlike any other sheath horn



SKULL OF A PRONGHORN.

Showing horn cores and dentition.

known, are branched, having one prong (occasionally more) on the anterior edge. Every winter these horns are pushed off by new hairy growths beneath them, comparable to the velvet of deer's antlers, which in turn harden into another pair of true horns. This distinction is deemed sufficient to justify placing the pronghorn in a separate family, the Antilocapridæ, intermediate between the giraffes and the Bovidæ. The horns of the female are rudimentary. The pronghorn is provided with several glands which secrete strong-smelling substances, especially during the rutting season. The most notable of these glands are just below the ear, one on each side. In summer the hair of the pronghorn is smooth and flexible, but as winter approaches it lengthens; each hair become thick, its interior becomes white and spongy, and it loses its flexibility, at last becoming brittle, so that its point is easily rubbed off. This singular fur forms a close and warm covering for the animal, but renders the skin useless as fur, nor does it make serviceable leather. The flesh, however, is delicious.

The pronghorn is confined to the open plains and thinly wooded parks and valleys of the Western mountains. It is suspicious and timid and liable to panic, when it will dance up and down; but when once away goes at a leaping pace which few greyhounds can outstrip. Early in spring the does separate from the winter herd and in some retired spot bring forth usually two kids. The does and kids soon gather into bands for mutual assistance in resisting their foes, and in the early autumn they are joined by the bucks, whose horns are new and who engage in fierce contests for the possession of the does. In former days these bands numbered thousands, and those in the northern districts regularly migrated to the southward when snow came. At the beginning of the present century the pronghorns had been so reduced and scattered that no herds of great number could gather.

Consult: Canfield, in *Proceedings of the Zoölogical Society* (London, 1866); Caton, *Antelope and Deer of America* (New York, 1877); Richard Lydekker, *Royal Natural History*, vol. ii (London, 1895); E. T. Seton, *Life-Histories of Northern Animals* (New York, 1909); and books on sport in the western United States and Canada.

PRO′NOUN (Fr. *pronom*, Lat. *pronomen*, word standing in place of a noun, from *pro*, for, before + *nomen*, noun). In grammar (q.v.), a word which stands for or instead of a noun (q.v.) in order to avoid the repetition of it. While the noun is at first concrete, the pronoun is abstract and thus represents psychologically a much higher concept than the noun. That it is of later development than the noun seems clear from its composite or suppletive inflection, being made up of a number of stems, still seen, e.g., in *I*, *me*, *we*, *us*. It had originally no connection with the noun, from which it differed in inflection and in usage. At a later period, however, the nominal and pronominal systems of inflection (q.v.) influenced each other, so that the pronoun shows a number of terminations which properly belong only to the noun, and vice versa. A careful distinction must be observed between pronouns with gender and those without gender. To the latter class originally belonged only the pronouns of the first and second persons and the reflexive pronoun of the third person (represented, e.g., by German *ich*, *du*, *sich*). All other pronouns had gender, which was probably natural, not grammatical, in character. (See GENDER.) These pronouns are demonstrative (as Skt. *sa*, Gk. ὁ, Lat. *ille*, 'that,' later 'the'), from which the modern pronouns of the third person are derived (cf. Eng. *he*, *she*, *it* with AS. *hē*, *hēo*, *hit*); relative (as Skt. *ya*, Gk. ὅς, Lat. *quis*, Eng. *who*), which are more intimately connected with the interrogatives than the demonstratives; and the interrogatives (as Skt. *ka*, Gk. τίς, Lat. *quis*, Eng. *who*). Of these classes the demonstrative, which is local in force, is probably the oldest. The relative, which introduces the relatively late sentence form of hypotaxis or subordinate clauses as contrasted with the more primitive parataxis or coördination, seems to be the youngest. Between the two, yet nearer to the demonstrative in point of age, stands the interrogative, which introduces a question. Consult: Heinrich Zimmern, *Vergleichende Grammatik der semitischen Sprachen* (Berlin, 1898); Karl Brugmann, *Vergleichende Grammatik der indogermanischen Sprachen*, vol. ii (Strassburg, 1892); Michel Bréal, *Essai de sémantique* (Paris, 1913); Leonard Bloomfield, *Introduction to the Study of Language* (New York, 1914).

PRONUNCIATION OF FOREIGN NAMES (Lat. *pronunciatio*, *pronuntiatio*, from *pronunciare*, *pronuntiare*, to pronounce, proclaim, from *pro*, before, for + *nuntiare*, to announce, from *nuntius*, messenger). The correct pronunciation of a proper name depends chiefly upon giving to the letters their correct value and to the syllables their correct degree of stress. The following rules or principles are intended to furnish only a general rule to aid in understanding the values of the letters that occur in the names of foreign languages using the Roman alphabet and to some extent transliteration from other languages, as the Russian and Greek. For the purposes of this article the best practicable method will be to explain the sounds mentioned by reference to the same sound in the English language or its nearest equivalent, the more accurate and scientific method adopted by phoneticians being too technical for this place. See DEAF MUTE; PHONETICS; VISIBLE SPEECH; and also consult the titles A, B, C, etc.

The number of syllables in foreign words is generally equal to the number of vowels, except in the case of doubled or geminate vowels, or diphthongs. In the respelling for pronunciation used in this work the syllables are separated from each other by accents (′ for primary stress and ′ for secondary) and hyphens (-), with the use of the apostrophe (') to indicate a lesser degree of separation between consonants than is made by a full vowel, as in the glides (obscured transitional sounds) and catches (certain spasmodic interruptions of the breath). Every letter in a respelled pronunciation is to be given its value as indicated in the Key to Pronunciation. In most cases in English words and names no pronunciation is indicated, because its proper pronunciation seems evident. Sometimes when the pronunciation of a word is sufficiently indicated by marking the accented syllable, the vocabulary title has been accented without respelling. When this happens in foreign words it means that the letters are to be given the values that they would naturally have in English.

Accent. In general it may be said that there are two kinds of accent, varying in quality—the tonic, or pitch, and the dynamic, or stress. Most modern languages have a stress accent, though in few is it as strong as in English. The unaccented syllables in foreign names, therefore, are generally more distinctly pronounced than in English, the vowels retaining to a great extent the quality of the long accented vowels, but without any glide.

Only a few general rules of accentuation can be given that are not subject to numerous exceptions. The following are therefore supplied merely as an aid in determining the proper pronunciation of foreign words. See ACCENT.

In *Arabic* the accent is on the last syllable, providing it terminates in a consonant. Otherwise it falls on the first syllable. In *Bohemian* (*Czech*) the accent is on the first syllable. In *French* the accent falls on the last syllable of a word, unless it terminates in a mute *e*, in which case the accent is on the penult. As the French accent is slightly tonic, syllabic stress is much less decided than in English. It should be noted that the accents printed over vowels in French have no relation to the spoken accent, but serve merely to indicate the pronunciation of those vowels. In *German* the accent is practically the same as in English. In modern *Greek* the stress follows the written accent and is not governed by the quantity of the vowels. In *Hungarian* the spoken accent is always on the first syllable, graphic accents being used only to indicate long vowels. In *Italian* the accent is nearly always the same as in Latin, i.e., it falls on the penult, except where the penult is short in Latin, in which case it recedes to the antepenult. A graphic or printed accent on a word usually denotes the spoken accent, except when the acute accent occurs over the vowel *i* in the terminations *ia*, *io*, and the grave accent is placed on the last syllable of oxytones and on some monosyllables. In *Polish* the accent is usually on the penult. In *Portuguese* the accent is generally upon the last syllable, except in case of words ending in a vowel, when it is mostly on the penult, though at times it recedes to the antepenult. In *Russian* no rule exists that is sufficiently general to be worth stating. The accent must be determined in each case by itself. In *Spanish* the accent is generally on the penult in words ending in a vowel or in the consonants *n* or *s*, and in other cases it is usually on the last syllable. When a final syllable ending in a vowel or in *n* or *s* is accented, the best present usage is to place a graphic accent on that syllable, and in like manner when a word terminating in a consonant other than *n* or *s* has the accent on the penult, that syllable bears the graphic accent. In *Turkish* the last syllable is generally lightly accented. In *Welsh* the accent is on the penult, except in a few cases where it is on the final syllable.

Letters—Vowels and Consonants. It is impossible within the scope of this article to make any attempt at a complete statement of the values of the letters and their combinations, even in the languages of modern civilized races. The following alphabetic list is intended only to aid in answering questions of a general nature.

a generally has the value of *a* in English *bath*, *fast*, or sometimes one approaching the sound of *a* in *cat;* in Hungarian *a* is nearly *o* in *hot*, and *á* as *a* in *far;* short *a* in Sanskrit and in many East Indian names is as *u* in *but.* *â* in Rumanian is as *i* in *tin;* in French nearly as *a* in *far.* *ä* or *ae.* (See *æ*, below.) *ă* in Rumanian resembles *e* in *her.* *ą* in Polish is like *a* in *fall*, nasalized. (See *n*, below.) *ã* in Portuguese. (See *am*, below.) *å* in Swedish is like *a* in *all*, or sometimes resembles *o* in *obey.*

aa in Danish and Norwegian is like Swedish *å*, above. For Dutch *aa*, see *æ*, below.

æ. In German *ae* (or *ä*) is nearly as *a* in *dare* or as *e* in *set;* in Dutch *ae* (now spelt *aa*), and in Flemish, is like *a* in *far;* in Swedish *ae* (or *ä*) is like *e* in *set* or in *there;* in Danish and Norwegian *ae* is often like *a* in *sat;* in Welsh *ae* is somewhat like *i* in *ice.* *ãe* in Portuguese is like *i* in *ice*, nasalized.

ai or *aj* (when *j* is a vowel) is usually a diphthong, essentially like the sound of *aye*, yes. It is generally represented by a long *ī*. In French *ai* is nearly as *e* in *met*, except when final, especially in verbs, it approximates *a* in *mated;* in modern Greek as *e* in *set* or *a* in *senate;* in Hungarian *aj* is as *oi* in *boil*, and *áj* nearly as the sound of *aye.*

ail, *aill*, *aim*, *ain*, in French. See *il*, *ill*, etc., below.

aj. See *ai*, above.

am, *an*, in French and Portuguese, when final or preceding a consonant other than *m* or *n*, have the sound of *a* in *far*, nasalized. (See *n*, below.) In French *em* and *en*, and in Portuguese *ã*, have the same sound.

ão in Portuguese is as *ou* in *house*, nasalized.

au generally is like *ou* in *house.* In French it is like *o* in *stone;* in modern Greek (*αυ*) it is like *av*, except before surd or mute consonants, when it is like *af.* *äu* in German is like *oi* in *boil.*

av in Danish before a consonant is like *ou* in *house.*

aw in Welsh is like *ou* in *house.*

ay is generally like *ai.* When it precedes a vowel, however, the *y* is often treated as a consonant, as in French and Spanish, and the preceding *a* given its proper value.

b at the end of a word, and generally when followed by a consonant, is pronounced like *p* in German, Dutch, and the Slavic languages. In Spanish and modern Greek its sound is like a *v* made with the lips alone and not with the lips and teeth. It is often interchanged with *v.*

bh in East Indian names. See *h*, below.

c before *e*, *i*, or *y* in German is like *ts* (Ger. *z*); in French, Portuguese, and Catalan, like a hissing *s*; before *e* and *i* in Italian it is like *ch* in *church;* in (Castilian) Spanish, like *th* in *thin*, but in Spanish America and parts of Spain like *s* in *sun;* in Rumanian before *î* it is like *k;* in Welsh and Gaelic it is always like *k;* in the Slavic languages it is like *ts.* *ç* is like *s* in *set.* *č* in Bohemian, Croatian, Servian, and Bulgarian is like *ch* in *chin.* *ć* in Polish is like *ch* in *chin.*

cc in Italian is like *t-ch*, as in *chit-chat.*

ch in Spanish, and generally in Sanskrit and East Indian names, is pronounced as in *chin;* in Italian and Catalan, like *k;* in German, with the same guttural sounds as *g* (see *g*, below); in Polish, with a similar guttural sound; in French and in Portuguese, like *sh* in *shin* (except in some classical derivatives, where it equals English *k*).

cs in Hungarian is as *ch* in *chin.*

cu in Spanish when followed by a vowel is like *qu* in *quick*, unless the *u* has the diæresis (*ü*) or is accented (*ú*).

cz in Polish is like *ch* in *chin;* in Hungarian, like *ts*.

d in German, Dutch, and the Slavic languages (Russian, Polish, etc.), when final, and generally when preceding a surd in the same syllable, is pronounced as *t;* in Spanish, modern Greek, and Danish when between two vowels or final it has a softened sound, usually stated to be like *th* in *then;* in Danish and Norwegian it is silent or mute after an *l* or *n* in the same syllable.

dd in Welsh is like *th* in *then*.

dh in East Indian names. See *h*, below.

dt in German is like *t* in *bit*.

e is generally equivalent, or nearly so, to *a* in *savior*, to *e* in *set*, or to *e* in *there*. In most foreign words the long sound of *e* does not have the glide that is heard in *ā* in English, as in *day*. In indicating the pronunciation of French the character *ȧ* is used both for the short and the long quantity of this sound. In French final *e* unaccented is silent, and it is usually silent or is much obscured when it ends a syllable other than the last. It is also practically silent in Portuguese when final. In Russian *e* is like *ye* in *yet* when it follows *d*, *t*, *l*, or *n*, or when it is at the beginning of a syllable. In modern Greek it has the values of *e* in *pet* and of *i* in *machine*. *é* in French is like *a* in *savior*. *è* and *ê* in French have the open sound of *e* in *met*, or the more prolonged sound of *e* in *there*. *e* in Polish is like *e* in *pet*, nasalized. (See *n*, below.) *é* in Bohemian is like *ye* in *yet*.

eau in French is like *o* in *no*. See the pronunciation given *au*, above.

eeuw in Dutch is like *a* in *fate* followed closely by (Dutch) *w*. (See *w*, below.) When the *w* is followed by an obscure *e* the *w* has a more consonantal sound.

ei in French is like *e* in *met;* in German, Dutch, and Welsh, like *i* in *ride;* and elsewhere it is generally a proper diphthong like *ay* in *fay*.

ein in French = *in*, below.

em, *en* in French = *an*, above; in Portuguese it is like *e* in *met*, nasalized. See *n*, below.

eu in French and Dutch is remotely like *e* in *her*, and equivalent to *ö*, below; in German, like *oi* in *boil;* in modern Greek (representing ευ), like *ev* before a vowel or sonant consonant, and like *ef* before a surd. *eu* is otherwise generally a diphthong composed of the sounds *ȧ* and *o͞o*, more or less closely united.

g is as *g* in *go*, *get*, in all the European languages before *a*, *o*, or *u;* and also in German whenever initial or followed by a vowel or liquid in the same syllable; in Swedish before *å*, or final after a vowel, or before *e* or *i* when short (except in *ge*); in Polish, before *e* and *i;* in Hungarian always, except in *gy*. (See below.) Before *e*, *i*, or *y* in French (see *ge*, below), Spanish, Portuguese, Rumanian, and Swedish (also in Swedish before *ä* or *ö* or after *l* or *r* at the end of a primitive word or syllable), it is equivalent to *j* (see *j*, below) in the same language; in modern Greek it is like *y* in *yes*. Before *e* or *i* in Italian it is like *j* in *jet*. In Dutch *g* regularly has the voiced sound of the German *ch* or final *g*. In German *g* also has a guttural sound, made between the back of the tongue and the soft palate, which may be voiced, as when medial after back vowels (*a*, *o*, *u*), or unvoiced, as when final after *a*, *o*, or *u;* and a fricative sound made between the hard palate and the tongue, which may be similarly voiced, as when medial after front vowels (*e*, *i*, *ö*, or *ü*), or unvoiced, as when final after *e*, *i*, *ö*, *ü*, or a consonant. (See the Key to Pronunciation.) German *ch* is pronounced like *g* in these positions.

gh is like *g* in *game* in Italian and Rumanian; in Irish it is like *h*, more or less strongly aspirated.

gli in Italian has the sound of *lli* in *million;* but in a few words borrowed from Greek or Latin it has the sound of *gl* in *English*.

gn in French and Italian is like *ni* in *union*. See *ñ* and *nh*, below.

gu before *e*, *i*, or *y* is like *g* in *go* in French, unless followed by a consonant or *ë*, when the *u* has its distinct value; likewise in Spanish, unless the diæresis is put upon the *u* (*ü*), when the *gu* is like separate *g* and *w*, as it is also before *a*, *o*, or *u;* and in Portuguese. In Italian *gu* is like *gw* in *Gwilt* before all vowels.

gy in Hungarian has the value of *d* followed by consonant *y*.

h in French, Italian, Spanish, and Portuguese is silent, or nearly so, except as it is considered in the various combinations *ch*, *gh*, *lh*, *nh*, etc.; in German it is silent between two vowels in the same word, except in polysyllabic words when the syllable with *h* has the principal or secondary accent, as in *Johann*, *Wilhelm;* in East Indian words it is generally pronounced like *h* in *hat*, distinctly heard in all situations, as after *b*, *d*, *t*, etc.; final *h* is often pronounced in Arabic and Persian names, properly with a harshly aspirated sound not heard in English; in Swedish *h* is silent before *j*.

i is usually like *i* in *pique* or *i* in *hit;* and sometimes like *e* in *set*, as in *-ling*, *-ding*, in Danish names.

ie is like *ie* in *field* always when final in French, and when medial in German, and before *r* in Dutch, and often when final in German.

ien in French is as *in* (see below) preceded by consonant *y*.

ij in Dutch is nearly as *i* in *ride*.

il final and *ill* medial in French have, when preceded by a consonant, the sound of English *i* in *machine* followed by that of *y* in *yet;* preceded by a vowel, the combination has merely the sound of *y* in *yet*. Formerly the *l* was also heard, as in English *million*, and this pronunciation is still adhered to by some.

im, *in* in French are like *a* in *rank* or *anger*. See *n*, below.

j in German, Dutch (see *ij*, above), Italian, Swedish, Norwegian, Danish, Hungarian, and Polish is like *y* in *yet;* in French, Portuguese, and Rumanian it is like *z* in *azure;* in Spanish, like a rough or strongly aspirated *h* (see *x*, below); in the Philippine Islands it is often like *sh* in *shun*.

k in Swedish before *e*, *i*, *y*, *ä*, or *ö* in the same primitive syllable is almost like *ch* in *church*.

kh in Oriental names is usually properly a harsh guttural aspirate; in Russian names, often like German *ch;* in East Indian names, like separate *k* and *h*. See *h*, above.

l is usually as in English (see *il*, *ill*, above); in Polish it is like *ll* in Spanish.

lh in Portuguese is like *ll* in Spanish.

ll in Spanish is like the *l-y* sound in English *million.* In colonial or dialectic Spanish *ll* is like *y* in *yet.* In Icelandic *ll* is like *dl* in *handlike;* in Welsh, as nearly as can be given in English equivalents, like *thl* or *tl.*

ly in Hungarian is like Spanish *ll.*

m and *n* are practically always as in English, except when used to indicate a nasal stop sound. (See *am, an, em, en,* etc.)

ñ in Spanish, *ń* in Polish, and *ň* in Bohemian, Bulgarian, Croatian, and Servian are like *ni* in *union.*

ng in German is always like *ng* in *singer.*

nh in Portuguese is like Spanish *ñ.*

ny in Hungarian is like Spanish *ñ.*

o is usually like *o* in *obey* or in *for,* but it frequently shades away from these sounds towards those of *o* in *not* and *a* in *cast;* but these variations may be sufficiently well represented as the ŏ̇ (see Key to Pronunciation) more or less slurred or clipped in pronunciation. *o* in Swedish has the sound of o͞o in *boot* or *u* in *full* when final or constituting a syllable, and also in the syllables *-nord, -port* when final. Final *o* in Portuguese is like *oo* in *fool.* *ó* in Polish is as *u* in *rude* or in *full,* and in Portuguese like *o* in *not.* *ö* (or sometimes *oe*) has no equivalent in English, but resembles *e* in *her,* and is the same as French *eu.* *ô* in French and in Portuguese is as *o* in *no.* *õ* in Portuguese is *o* as in *no,* nasalized. See *m,* above.

oe is sometimes used for *ö* (above), with the same value; in Dutch it is as *u* in *rude, full;* in Low German names, like *o* in *note;* in Welsh, somewhat like *oi* in *boil.*

õe in Portuguese is like *oi* in *oil,* nasalized. See *m,* above.

œu in French is like *eu* (above).

oi is usually nearly like *oi* in *boil;* but in French is regularly nearly like *wa* in *watch;* in modern Greek, like *i* in *pique.*

oin in French is French *in* (above) preceded by English *w.*

oo is usually *o* as in *no, oh.*

ou in French and modern Greek is like *u* in *rude;* in Dutch and Norwegian, like *ou* in *mouse;* in Portuguese, nearly as *o* in *no.*

ouw in Dutch is nearly as *ou* in *mouse.*

ow in Low German names is as *o* in *no.*

p is as in English.

qu in French, Spanish, and Portuguese, before *e* or *i,* has the sound of *k;* in German it is like *kv.* Otherwise it is usually equal to *kw,* as in Spanish, Portuguese, and sometimes in French before *a, o,* or *u,* in Italian always, etc.

qv in Swedish is equal to *kv.*

r is usually pronounced with much more trill than it has in English. A gutturalized or velar *r* is also heard, as in some pronunciations of French and German, that has no equivalent in English. *ř* in Bohemian is like *r* followed by the sound of *z* in *azure.*

rz in Polish is like the sound of *z* in *azure.*

s has the sound of *z* in *zinc,* in German when initial followed by a vowel or medial, in Portuguese when medial, and in French when between two vowels or when carried over to the following word. It has the sound of *sh* in *shine* in Hungarian, in Portuguese when final or before a surd (except *s*); in German before *p* or *t.* In Italian *s* before a vowel is sometimes like *s* and sometimes like *z,* depending on usage. Otherwise than as above noted, *s* is usually like *s* in *sin,* as always in Spanish, Dutch, and Swedish. *š* in Bohemian, Bulgarian, Croatian, and Servian, and *ș* in Rumanian, is like *sh* in *shun.*

sç in Rumanian is like *sh* followed by *t,* before *e* or *i.*

sc in Italian before *e* and *i* is like *sh* in *shun.*

sch in German is like *sh* in *shun;* in Italian and Rumanian, before *e* or *i,* like *sk* in *skin;* in Dutch before vowels, except obscure *e,* like *sg* (see below), otherwise like *s.*

sg in Dutch is *s* followed by the guttural *g* of Dutch, resembling *sk* in English.

sj in Dutch, Swedish, and Danish is like *sh* in *shun.*

sk is like *sh* in *shun* in Swedish and Norwegian before *e, i,* or *y.*

skj in Swedish and Norwegian is nearly as *sh* in *shun.*

ss in Hungarian is a strong *sh* in *shun;* but elsewhere usually indicates a surd *s,* single or doubled, as in German, Dutch, etc.

ssz in Hungarian is a prolonged *s* sound.

stj in Swedish is nearly as *sh* in *shun.*

sz in Hungarian is as *s* in *sin;* in Polish as *sh* in *shun.*

t after *n* in modern Greek is as *d.* *ţ* in Rumanian is as *ts* in *pits.*

th in modern Greek (*θ*), Welsh, and Icelandic is like *th* in *thin;* otherwise like *t,* or *th* in *thyme,* in all the modern European languages.

tsch in German is as *ch* in *church.*

ty in Hungarian. See *y,* below.

tz in German is as *ts* in *pits.*

u is usually as in *rule* (o͞o) or *put* (ụ). In French and in open syllables in Dutch it has no English analogue. The correct sound may be approximated by attempting to pronounce ē with the lips in the position for pronouncing o͞o. In Welsh *u* is like *i* in *machine;* in Rumanian it is usually silent when final. *ü* (sometimes printed *ue* in German and Turkish) is like *u* in French. See above.

ue, except when representing *ü,* usually combines the sound of *u* and *e,* more or less closely joined in pronunciation.

ui in French is much like English *we,* and is best produced by pronouncing slightingly the French *u* and accenting the following vowel (but see *gu, qu,* above); in Dutch, nearly as *oi* in *boil.*

um, un in French are nearly as *u* in *hurt,* nasalized; in Portuguese, as Portuguese *u,* nasalized. See *m,* above.

uu in Dutch is Dutch *u* prolonged.

uy in French is like *ui* (see above), except before a vowel, when it is like *ui* followed by *y* as in *you.*

v in German, Dutch, and the Slavic languages (Russian, Polish, etc.) is usually as *f* in *fin,* but sometimes as *v* in *vine.*

w in German, Swedish, Norwegian, French, and Polish is like *v* in vine; in Dutch it is like a *w* made without rounding the lips; in Welsh it is usually as o͞o in *food.*

x in modern Spanish is usually as *x* in *fox;* sometimes it is as *j* or *g.* (See *g,* above.) In colonial Spanish, especially Mexican, and in some dialects in Spain, it often is as *s* in *sin.* In Portuguese *x* has the sound of *sh* in English.

y is generally like *i* in *machine.* In Danish, Swedish, and Norwegian it is like French *u; ym* and *yn* in French are like *im* and *in.*

z is as *ts* in *hats* in German; in Swedish, Danish, and Norwegian, like *s* (see above); in Spanish, like *th* in *thin,* but in American Spanish and in some dialects in Spain like *s* in *sin;* in Italian, like *ts* or *dz* (as in English *adze*) or sometimes nearly as the English *z*. Otherwise it is usually as *z* in *zinc*, as in Dutch, Polish, Hungarian, etc. *ż* in Polish is as *z* in *azure*. *ž* in Bohemian, Bulgarian, Croatian, and Servian is like *z* in *azure*, or, when final, like *sh* in *ship*. *ź* in Polish is a softened *z*, much like *zh*. *zs* in Hungarian is like *z* in *azure*.

Consult: Paul Passy, *Petite phonétique comparée des principales langues européennes* (2d ed., Leipzig, 1912); Laura Soames, *Introduction to English, French, and German Phonetics* (3d ed., London, 1913); Leonard Bloomfield, *Introduction to the Study of Language* (New York, 1914); T. W. Viëtor, *Elemente der Phonetik des Deutschen, Englischen und Französischen* (6th ed., Leipzig, 1914).

PRONVILLE, Alexandre de. See Tracy, Marquis de.

PRONY, prŏ̇'nĕ̇', Gaspard Clair François Marie Riche, Baron de (1755–1839). A French engineer and mathematician, born at Chamelet and educated in the Ecole des Ponts et Chaussées. In 1785 he was put in charge of the restoration of the harbor of Dunkirk, and in 1794, after the completion of his great tables of logarithms to 25 decimal places, the first made under the metric system, he was named professor of mathematics at the Polytechnique. Four years afterward he was appointed head of the Ecole des Ponts et Chaussées. He was a member of the Academy of Sciences. Prony held office through the Empire and was connected with the great sanitary measures undertaken in the Pontine Marshes and along the valley of the Po. His more important works include: *Nouvelle architecture hydraulique* (1790–96); *Leçons de mécanique analytique* (1815); *Description hydrographique et historique des marais Pontins* (1823); *Notice sur les grandes tables logarithmiques* (1824).

PRONY BRAKE. A form of absorption dynamometer applied to a revolving shaft or pulley. It consists of a lever so connected that the friction induced by the revolving shaft will tend to rotate the frame of the lever in the direction in which the shaft revolves, but by the use of weights or springs at the end of the lever this rotation is counterbalanced. With a given number of revolutions weights may be added to the end of the lever and pulleys connecting the friction surface may be screwed up so that the lever is maintained in a horizontal position. Various modifications of the apparatus are employed. The equation for determining the horse power or work of a revolving power or shaft is as follows: W = work of shaft = power observed per minute; P = unbalanced pressure or net pull in pounds acting on lever arm at distance L; L = length or radius of lever arm in feet from centre of shaft; V = velocity of a point in feet per minute at distance L if the arm were allowed to rotate at the speed of the shaft; N = number of revolutions per minute; HP = horse power.

Therefore $W = PV = 2\pi LNP$; for $HP = PV \div 33{,}000$.

Therefore $HP = 2\pi LNP \div 33{,}000$; for $L = 33 \div 2\pi$, $HP = NP \div 1000$.

Therefore $33 \div 2\pi$, or 5 feet, 3 inches, is a convenient value to be used for the length of the arm.

If an electric motor is being tested and it is desired to obtain the power output in watts, watts $= LNP \div 7.04$.

Consult J. J. Flather, *Dynamometers and the Transmission of Power* (2d ed., New York, 1900), and Kent, *Mechanical Engineer's Pocket-Book* (8th ed., New York, 1913). See Dynamometer.

PRO'NYMPH (from Lat. *pro-*, before + *nympha*, Gk. *νύμφη*, *nymphē*, bride, nymph). A stage of development with certain dipterous insects which transform within the last larval skin. This last skin having hardened and contracted, the insect within it loses all apparent structure and becomes an accumulation of soft, creamy matter within a delicate membrane. This condition begins in the resting larva, and the surrounding membrane is probably the larval hypodermis. In this pronymph the organs gradually take shape until a true pupa, corresponding to that of a hymenopterous insect, is formed.

PROOF (OF. *prove*, *preuve*, Fr. *preuve*, from Lat. *proba*, proof, from *probare*, to test, examine). In art, a trial impression taken to show the state of an engraving, etching, medal, or coin die during execution. (For proof in printing books and periodicals, see Printing; Proof Reading.) Thus, in the art of die sinking, impressions called proofs are taken from the die from time to time in order to guide the artist. They are struck in metal of no great intrinsic value except in the case of the last state of the die, when a proof will be taken in the metal intended to be used. As, however, there is great demand with both museums and private collectors for the proof copies of coins and important medallions, it is not unusual to take a number of such impressions from the completed die. These are sometimes marked as proofs by having a peculiar characteristic. Thus, all modern coined money is saved from the attacks of coin clippers by having raised letters around the edge, such as "Dieu protège la France," on French coins of the Third Empire and the Republic, or by having the edge fluted or reeded with little bars across it. These will be omitted in the proofs.

The most important use of the word in connection with the arts is the name given to trial impressions from an engraved wood block or plate. (See Print.) It is customary to take these proof impressions at different times as the plate approaches completion, and such impressions are called engravers' proofs, and, in spite of their showing an incomplete state of the plate, are sure to command high prices in an engraving of any importance. The engravers' proofs, taken as the plate approaches completion, are extremely brilliant and effective, because they are taken one by one, by hand, and with great care; the same brilliancy is preserved in the earliest proofs which are printed off expressly for sale. These are often classified in some special way, as by etching upon the margin of the plate some very small design, as a head, a figure of a bird or beast, or even a sketched incident with two figures, and this little picture is printed with the large composition. Impressions so taken are called *remarque proofs* and are recognized as being the earliest, the *remarque* being planed away or the plate cut down, the proofs next taken are known as artists' proofs. All this time the intended lettering on the edge of the plate, i.e., the title of the picture and the name of the engraver, and of the artist of whose original work the engraving is a copy in so many cases, have not been added. Proofs made from the unlettered plate are called generally *proofs before the letter.* If, now, the names of the original artist, if any, and of the engraver are added just below the edge of the picture, proofs taken at this stage are called *proofs before the title.* What is said here of the engraver's or artist's name does not refer to the appearance of any artist's signature within the boundaries of the picture itself; for in many etchings and similar works the signature is almost a part of the design. Proofs with open letters are those in which the large capital letters of the title are inserted, but left in outline. After these letters are completed, the ordinary prints are taken.

There are still to be noted the proofs of artistic engravings, which are never lettered on the margin, which are not intended to have any title, or any name of artist or publisher, or any number or letter whatever on the margin. A conscientious etcher is very careful in noting the number of editions printed from any plate thus unsigned. The plate may be changed after any given printing; new effects may be produced, worn lines strengthened.

From this it will be seen what is the real importance of first state and second state, and the like, in artistic engravings. The first state is apt to be preferred, because there is certainty that the plate has not been worn at this stage of its existence. It may be, however, that the second state is preferred for many reasons. There are some of the *Liber Studiorum* in which the second state is admittedly finer. An impression on vellum of the second state of an etching may be better than an impression on paper of the first state, because prints on vellum are carefully taken and because of the exceptional beauty of a print upon this particular material. Again, the first state may be known from the second state or other subsequent states only by some very slight and hardly noticeable modification. Consult the bibliography of Engraving; Etching; Line Engraving; Wood Engraving.

PROOF. In law, the process of establishing an alleged fact for judicial purposes. This may be effected by the rational process of inducing persuasion by the submission of evidence or otherwise, or it may consist in the employment by the party having the burden of proof of formal acts or words or in the performance of certain acts which of themselves amount to proof of the fact alleged. In its present form proof consists in all the various means by which, under the rules governing judicial procedure, persuasion of the court or jury is brought about, and includes observation or inspection (as of a child to determine its age or parentage), general knowledge (judicial notice) —as of facts of common knowledge—brought to the attention of the court or jury, and argument as to the inferences that may properly be drawn from facts admitted or established, as well as the submission of evidence under oath. The popular use of the term "proof" as synonymous with proof by sworn testimony or other legal evidence is therefore too restricted and misleading. Consult: Blackstone, *Commentaries on the Laws of England* (4th ed., 2 vols., Chicago, 1899); Pollock and Maitland, *History of English Law* (2d ed., Boston, 1899); Bentham, *Rationale of Judicial Evidence* (London, 1827); Thayer, *Preliminary Treatise on Evidence at the Common Law* (Boston, 1898); Gulson, *The Philosophy of Proof* (London, 1905); Gross, *Criminal Psychology* (Boston, 1910); Arnold, *Psychology Applied to Legal Evidence* (Calcutta, 1913); Wigmore, *The Principles of Judicial Proof* (Boston, 1913). See Burden of Proof; Evidence; Trial; and, as to earlier modes of proof, Battle, Trial by; Compurgation; Ordeal.

PROOF READING. The reading of printers' proofs, for correction of errors in the type or, by authors or editors, for final approval or alteration. Proof readers are sometimes called "correctors of the press," and their work "correction of the press," especially in Great Britain. Of course, the assembling of types, one by one, from their boxes in the printer's case, or the striking of a corresponding number of keys in machine composition, is not done by the average worker without accidents, making errors that need correction; and the work, besides the mere technical minutiæ, comprehends reproduction from handwriting that presents many points of perplexity. In fact, typographic composition is liable to error in more ways than any person not a printer could possibly imagine. Thus it may be seen that correction through proof reading is a most important feature of the production of printed matter. In fact, sometimes the work thus done is one of the largest items of expense.

Special marks are universally used by printers in correcting proofs, and authors and editors will find advantage in knowing and using these marks, mainly because of their inherent simplicity. Absolute simplicity in indicating changes, however, is the only essential desideratum. If a desired change is shown on the margin of a proof so plainly that it cannot be misunderstood, its conformity or nonconformity to technicality is of no consequence. One method of marking a proof will almost surely fail, and that method is one that suggests itself instinctively to the novice. It is that of making changes within the bounds of the text, such as a line through an extra letter or word that should be taken out, or writing a comma or other point after a word, with no mark in the margin. Proofs have been so corrected, and great disappointment felt because the final result showed neglect of the corrections. Markings for correction may be enumerated as follows:

1. In ordering the removal of anything not desired a novice might write a full direction, as "this is to be taken out," but the proof reader makes in the margin, opposite a crossed letter, word, or words, the sign ꝺ, which is merely a specialized form of the initial letter of the word *dele*, meaning "take out." One way secures the result as well as the other, but the second plainly shows its economy, which exemplifies that of all marks peculiar to proof reading. Frequently a number of corrections must be made in the same line, and in this case the only really arbitrary mark is used, being a vertical stroke, placed after each marginal item, merely for separation. Some readers make such a stroke after each correction in the left-hand margin, but before those in the right-hand. It is better always to have it follow, as that practice becomes so instinctive as to free the mind from unnecessary formality and so assists towards concentration of attention, which is the key to success.

2. A wrong letter is corrected by making a

stroke through it and writing the proper letter in the margin. Exact system in the arrangement of marginal items is very desirable. Thus, a line may contain a number of errors, and it is much easier for the compositor to trace the corrections if made in regular order, exactly in line with the corresponding faults. It is well worth while to cultivate the habit of using the margin on the left for corrections in the first half of the line and that on the right for others; also to write the first one well out towards the left edge and the first on the other side near the print. Some proof readers make the first mark on the right distant from the print, and those for later positions nearer, thus undoubtedly causing loss of time to the correctors of the type, who have to trace out the correspondences.

3. Change of place, whether of a letter, a word, or many words, is called transposition. Such change within a line is indicated by a line drawn above, below, or around the first letter, word, or words, and under or above those following, to a caret indicating the new place for the matter shifted, and by "tr." written in the margin. For transposing letters merely, it is much better to cross them and write the letters themselves in proper order, especially for machine composition. To transpose paragraphs, a line is made alongside the first and a connecting line to its new place, and "tr." is written opposite the first. Many write "transfer," but "transpose" is the printers' word.

4. For change of type a line should be drawn under the text and "rom." written for substitution of roman instead of italic, "ital." for changing roman to italic, "l.c." for lower case, "s.c." or "s. caps" for small capitals, and "c." or "caps" for capitals. For a single letter or two letters together it is economical to write the letters themselves in the margin, with one line underscoring for italic, two lines for small capitals, and three for capitals. One line is sufficient in any case under the type that is to be removed. In manuscript one line of underscoring directs the use of italic; two, small capitals; and three, capitals.

5. To correct type of wrong form—too heavy, too light, etc.—"w.f.," meaning "wrong font" (type of a wrong kind), is written.

6. A direction to leave unchanged anything that has been crossed is given by making dots under it and writing "stet" (meaning "let it stand as it is") in the margin.

7. Omission of a word or words is called an "out" by printers, but that of a point or a part of a word is not so called, though the method of correcting is the same. A caret (∧) is made in the place for insertion, and the character or words (the "out") written directly opposite when possible; but otherwise it may be placed according to convenience, with a line drawn to it. When an "out" is too long to write in the margin, the proof reader writes in its place "out, see copy," marks the matter omitted on the copy, and sends it to the compositor with the proof. For insertion of a space, the sign # is written in line with the caret. A square (□) is made for insertion of an em or square of space.

8. Superior and inferior characters are indicated thus: $\overset{,}{\vee}$ $\overset{1}{\vee}$ $\overset{a}{\vee}$ $\underset{1}{\wedge}$ $\underset{a}{\wedge}$. The first of these marks is an apostrophe, never called a "superior comma" by printers, who would hardly know it by that name.

9. The meaning "turn this character right" is indicated by the mark ୨. Some proof readers make it ᘓ in the right-hand margin, but simplicity is gained and nothing is lost by making it always the same.

10. A mark $\underset{\smile}{!}$ indicates that a space (a low blank type) is to be pushed down so that it will not print.

11. Crookedness of lines is noted by strokes (=) above and below and repeated in margin.

12. Elimination of space between characters is directed by the use of tie marks (⊖). These should also be used above and below the dele mark ($\overset{\frown}{\underset{\smile}{\vartheta}}$) when letters from between which a hyphen is removed are to be drawn together. When a space is to be used in place of the hyphen, the marking should be the same as for changing a letter—the hyphen crossed out and a space mark written in the margin.

13. A new paragraph is ordered instead of a mere sentence by making a caret and placing the sign ¶ in the margin. Change from a paragraph to a sentence is shown by a connecting mark from the lower line to the upper and in the margin either "no ¶ " or "run in."

14. Reduction of space between words is directed by a mark (√) at the top of the letters, which is equivalent to writing "take out some of the space."

15. Marks expressive of meanings that could not be more clearly told are ┌──┐ └──┘ [ ]. They are used when anything is to be raised, lowered, or drawn to left or right.

The matter of convenience in the arrangement of marginal marks is worthy of very careful consideration. The proof readers whose practice is best are those who have begun with serious determination that such convenience must be conserved and have never allowed haste or pressure of any kind to swerve them from this path of rectitude.

PROP'AGAN'DA (Lat. *de propaganda fide*, concerning the propagation of the faith). The name of the most important of the Roman congregations or committees of cardinals for the administration, under the Pope, of the Roman Catholic church. It was established in the seventeenth century, partly to work in the countries lost by the Reformation, partly to evangelize the newly opened pagan lands. Those parts of the world which are designated as "missionary countries" come under its immediate jurisdiction, even when possessing an organized hierarchy. In general, they are those which are non-Catholic in government, with some exceptions, as Russian. They include: in Europe, the British Isles, Norway, Denmark, Holland, Switzerland, Greece, the Balkan Peninsula, and parts of Germany; all of North America except Mexico; all of Asia but the Patriarchate of Goa and the Philippines; all of Africa except Algeria and certain dioceses subject to European metropolitans; Australia and Oceania. The churches of the Oriental Rite also come under the Propaganda. Consult: A. Pieper, *Gründung und erste einrichtung der Propaganda-Kongregation* (Munich, 1901); Freri, *The Society for the Propagation of the Faith and the Catholic Missions* (Baltimore, 1902); id., *The Missionary Work of the Church* (New York, 1908). See MISSIONS, CHRISTIAN.

PROPAGATION OF THE FAITH, SOCIETIES FOR THE. See MISSIONS, CHRISTIAN.

PRO'PANE (from *prop-yl*, from *prop-ionic*, from Gk. πρῶ-τος, *prō-tos*, first + πίων, *piōn*, fat

+ *meth-ane*), C_3H_8. A gaseous compound of carbon and hydrogen existing in small quantities in crude petroleum. Its illuminating power is half again as great as that of ethane (q.v.); like ethane, it is practically insoluble in water, but, under ordinary atmospheric pressure, dissolves in one-sixth of its volume of absolute alcohol. The highest temperature ("critical temperature") at which it may still be liquefied is 97.5° C. (207.5° F.). It is produced when acetone, glycerin, and certain other substances are heated with hydriodic acid to 280° C. (536° F.), but it may be best prepared in the pure state by treating isopropyl iodide, $(CH_3)_2CHI$, with dilute hydrochloric acid. See Hydrocarbons; Carbon Compounds.

PROPANOL. See Menthol.

PROPELLER SHAFT, in Motor Vehicle. See Motor Vehicle.

PROPENYL ALCOHOL. See Glycerin.

PROPER (OF., Fr. *propre*, from Lat. *proprius*, peculiar to one's self). In heraldry (q.v.), a charge borne of its natural color.

PROPER'TIUS, Sextus (c.49–c.15 B.C.). A Roman elegiac poet. He was an Umbrian by birth, and his native town was in all probability the city of Asisium. He was of equestrian rank, and his father, who had joined Lucius Antonius, had lost much of his estate, which was confiscated by Augustus. Concerning the poet's life there are but few data. After his father's death he came to Rome, probably about the age of 16, and studied law. This profession, however, proved but a nominal one, for his real life work lay in poetry. His first patron was Volcatius Tullus, but, after the publication of his first book, he was presented to the famous Mæcenas (q.v.), who became his lasting friend. The relations of Propertius with his fellow poets were most harmonious. He is mentioned frequently by Ovid with unmistakable affection, and he speaks of Vergil with enthusiasm. Although neither Horace nor Tibullus is named in his poems, his work contains many reminiscences of both. Of the latter part of the life of Propertius we know nothing. He speaks of himself as a valetudinarian, and he died at Rome, probably at the age of about 35. According to Pliny, he married after the death of his mistress and left a son, but this account is rightly discredited.

The work of Propertius falls into two classes: first, and by far the more important, love elegies, and, second, poems of eulogy. Indeed, the great event of the poet's life, and the only one of real importance so far as his literary activity is concerned, was his love for a mistress, somewhat his senior, whom he celebrated as Cynthia, but whose real name, if we may believe Apuleius (q.v.), was Hostia. She was probably the sister of one Hostius (q.v.), who is known only as the author of a lost epic entitled *Bellum Histricum*. In character she seems to have been light, fickle, vain, and mercenary, yet she was witty and beautiful. In his early youth the poet had had an ephemeral passion for a slave girl whom he calls Lycinna, but after his acquaintance with Cynthia he appears to have been loyal to her for several years. At last, probably after some five years, there came a break in their union, although they seem to have been reconciled before her death. In the poems addressed to her Propertius appears at his best, although the letter of Arethuse to her husband, Lycotas, foreshadowing the *Heroides* of Ovid, shows pathos rarely beautiful. The two dominant notes of his poetry are passion and erudition. As his models he took the Greek Alexandrine school of poetry, following especially Philetas and Callimachus, being himself called "the Roman Callimachus."

In comparison with his love poems his eulogistic verse is of slight interest. Urged by Mæcenas to write in epic strain, he pleaded his unsuitability to the task. The justice of this self-judgment is confirmed by his elegies on Vertumnus, Tarpeia, Hercules and Cacus, and Jupiter Feretrius, for all of which he probably drew his material chiefly from Varro (q.v.). Yet he treated also contemporary events in his poems on the battle of Actium and the deaths of Cornelia and Marcellus, and the preparations of Augustus against the Parthians.

The first book of the elegies was published by Propertius, probably about 28, under the name of *Cynthia*. Although the dates of the remaining books are somewhat uncertain, the second and third seem to have appeared about 26, the fourth about 21, and the fifth about 16. The very number of the books is a disputed question. They were supposed to be three until the edition of Lachmann (q.v.), who divided the second book into two. Despite the arguments in favor of such a division, objections may be advanced against it.

The manuscripts of Propertius are very late and extremely corrupt. His works were apparently unknown throughout the Middle Ages; the earliest mention of a manuscript of them is of one in the possession of Petrarch. The best is the *Codex Neapolitanus*, dating from the twelfth or the thirteenth century, and now in the library of Wolfenbüttel. The influence of the poet on literature has been slight, although it is noteworthy that he inspired Goethe to the composition of his *Römische Elegien*.

The first edition of Propertius was published at Venice in 1472. Other important old editions were by Scaliger (Paris, 1577), Passerat (ib., 1608), Broukhus (Amsterdam, 1727), Vulpi (Padua, 1755), and Burmann (Utrecht, 1780). The editions of Lachmann (Leipzig, 1816; Berlin, 1829) were epoch-making in Propertian criticism. Other editions have been published by Jacob (Leipzig, 1827), Hertzberg (Halle, 1843–45), Paley (London, 1872), Bährens (Leipzig, 1880), Palmer (Dublin, 1880), Postgate (London, 1894), Rothstein (1898), H. E. Butler (London, 1905); and the text only by Keil (Leipzig, 1850), Haupt (5th ed., ib., 1885), Müller (ib., 1870), J. S. Phillimore (Oxford, 1906). English translations have been made by Cranstoun (London, 1875), Moore (Oxford, 1870), J. S. Phillimore (Oxford, 1906), and H. E. Butler (London and New York, 1912). Consult also: Jacob, *Propertius* (Lübeck, 1847); Plessis, *Etudes sur Properce et ses élégies* (Paris, 1886); Davies, *Catullus, Tibullus, and Propertius* (London, 1876); W. Y. Sellar, *Horace and the Elegiac Poets* (Oxford, 1892); W. S. Teuffel, *Geschichte der römischen Literatur*, vol. ii (6th ed., Leipzig, 1909); Martin Schanz, *Geschichte der römischen Litteratur*, vol. ii, part i (5th ed., Munich, 1911).

PROP'ERTY (OF. *properte*, from Lat. *proprietas*, property, peculiar nature or quality, from *proprius*, peculiar to one's self), Law of. In the broadest sense (which is also in English the ordinary sense), property includes all rights that are primarily economic in their object, all rights that constitute legally protected wealth. It thus includes all rights in corporeal things, whether immovable or movable; all rights to demand from particular persons (debtors) acts or omissions that are primarily of economic value; and all monopolies, such as patent rights, copyrights, franchises, etc. Excluded in modern law are the rights of a public officer or of a citizen, and the rights of a husband or father or guardian over the person of a wife or child or ward; because, although these rights may have economic value, modern law does not regard them primarily from this point of view. Modern theory, indeed, regards all public and family relations rather from the point of view of duties than from that of rights (q.v.).

Early Law does not draw these distinctions. All early private rights are, in a broad sense, property rights. Our Aryan ancestors apparently used the same word (Ger. *mund*, Lat. *manus*, the hand) to indicate legal power over inanimate things, animals, slaves, delinquent debtors, wives, and children; and it is probable that the powers of owners, masters, creditors, husbands, and fathers were originally equally unlimited. (Cf. MARRIAGE; PARENT AND CHILD.) In early German law the same word (*mund*) was applied to the power of the King, and throughout the Middle Ages governmental powers were generally treated as property rights. Survivals of these early views are found in the English common law, e.g., in the description of a public office as an "incorporeal hereditament" and in the treatment of paternal right as a right to services.

Roman Law. The Roman law of property originally included family rights. The earliest classification of property, which appears in the Twelve Tables, is (1) *familia*, the household, which includes land and agricultural easements, beasts of draft and burden, slaves, wife and children; and (2) *pecunia*, which includes all other things. Since things of *familia* were capable of conveyance only through a formal sale before witnesses, known as mancipation, they were also termed *res mancipi*, and the things of *pecunia* were termed *res nec mancipi*. In early Roman law these two classes of property seem to have been protected by different remedies and to have been governed by different rules as regards testamentary disposition. In the later law, as modified by the prætors, the distinction lost all practical importance. In the later jurisprudence family rights were taken out of the category of property (*res*) and put under the law of persons.

The Roman law also developed a clear distinction between ownership and all other rights in things. 1. Ownership (*proprietas*) included all powers that were neither specifically withheld by the law, in the interest of the community, nor specifically granted by the owner to another person. Ownership was thus at once the general and the residuary right over things. 2. All other rights (*jura in re*) were limited either in content or in duration. These limited rights were either (*a*) rights of use, viz., servitudes (q.v.) and long leaseholds, or (*b*) rights of eventual sale, created to secure debts, viz., pledge (*pignus*, q.v.) and hypothecation. (See HYPOTHEC, HYPOTHECATION.) With rare exceptions rights in things could be freely alienated, and, unless restricted to the single life, they were subject to free testamentary disposition.

Modern European Codes. In the law of real property the disappearance of feudal tenures and the conversion of peasant holdings either into ordinary leaseholds or into freeholds has practically reëstablished the simpler Roman categories. Political power has been separated anew from property right, and there is no eminent domain except that of the state. On the other hand, the general introduction of official registration of conveyances, mortgages, etc., and the disposition to protect the honest purchaser who relies upon the public records have greatly modified the Roman rules. The registered grantee or mortgagee is always protected against the holders of unregistered titles, and in modern German law there is, properly speaking, no title without registration.

As to movable property, nearly all the European codes have accepted the old German rule that honest possession is good title except against a prior possessor by whom the thing was lost or from whom it was stolen; and even in the case of lost or stolen property, the possessor who has purchased the thing "at a fair, in a market, at a public sale, or from a merchant who deals in such articles," is not obliged to surrender it until the price which he paid for it is refunded. In the modern German code the rule is somewhat different: purchase in market overt does not protect the possessor of lost or stolen things, but purchase at a public auction gives him an unassailable title. In the German code, also, the honest possessor of money or of negotiable paper payable to bearer is always owner, and similar rules are contained in the commercial codes of several other countries. It follows from these rules regarding movable property that no hypothecation of such property is recognized, but only pledge accompanied by possession.

The principle which underlies all these modern rules is that of publicity. Rights which run against all the world must be evident to, or at least ascertainable by, all the world. This end is gained, as regards real property, by registration of titles. As regards movable property the only public evidence of title is possession.

English and American Law. The common law of property has departed widely from the conceptions of the civil law, owing mainly to the independent development of the law of land under the influence of the feudal system. That system was late in establishing itself on English soil, but once established it impressed itself rapidly and permanently on the law of property. The fundamental distinction between movables and immovables disappeared, and we have, in their place, real and personal property, based on the distinction between real and personal forms of action. The real action was available to recover the very thing (*res*) of which the person instituting it had been deprived—primarily land and its fixtures. The personal action was instituted to recover damages from the person whose detention or destruction of a chattel had rendered him amenable to legal process. The two categories thus formed were swelled by circumstances, by analogy, by considerations of convenience, resulting in a curious composite. To real property were added all the so-called incorporeal interests, whether they had to do with land or not—as easements, profits à prendre, rents, tithes, offices. So, too, as real property passed by descent to the heir of a decedent, everything which by local or general custom passed to an heir and not to an executor came to be included in the description of real property—such as the crown jewels, heirlooms, titles of honor. On the other hand, certain interests in land, as leaseholds, creditors' estates, mortgages, and shares in landholding corporations, came into the classification of personal property, for the contrary reason that upon the death of the holder they passed not to his heir, but to a personal representative.

But this grouping of property relations was only indirectly and somewhat obscurely determined by the feudal system. Its direct effect was to create a wide and permanent separation between the two systems. This it did by its transformation of real property through the doctrine of tenures. Personal property was left, as in other legal systems, subject to ownership in the full sense of that term. But real property could only be "held" of some one else and in subordination to the rights of a superior holder. We have, therefore, landholders, not landowners. The distinction is of fundamental and far-reaching importance. The only owner of land is the king, the state. The subject can have at most an estate in it, i.e., a *status* with reference to it. The greatest estate possible—the pure fee simple absolute—is less than complete ownership, being a derivative and subordinate right, subject to the superior claims of him—whether a private person or the state—of whom the land is held. Property in land, therefore, is not the land itself, but an estate of longer or shorter duration in the land, together with certain rights of use and enjoyment. These rights depend upon the nature of the estate, whether for life, in fee tail, or in fee simple, and are originally curiously limited, even in such vital matters as alienation and inheritance, by the claims of the superior lord. These feudal restrictions have disappeared with the system which gave them birth, and in recent years the principle of estates has in a limited form been extended to personal property, but land is still held of the state, while personal property owes no duty to any one but the owner. See ESTATE; FEE; FEUDAL TENURE.

There is a further refinement in the common-law conception of property to be noticed in order to make our understanding of it complete. There may be rights not amounting to full ownership and yet recognized as property rights and legally protected as such. Just as, in the law of real property, several persons may have estates in the same parcel of land—one for years, another for life, another in fee, and so on—so also may a chattel be subject to a divided ownership. The faint line which divides a rightful possession from ownership has been traced in the article on POSSESSION. It appears most plainly in our law in the doctrine of pledge. The pledgor of a chattel does not lose his property therein, but the pledgee gains something more than a mere right of detainer. He also has a "property" in the article pledged, distinguished as a "special" property, the pledgor or owner (if we may still call him so) having the "general" property therein. Property is thus, like ownership in Blackstone's famous passage, a complex of rights, all of which may be united in one and the same individual or which may be divided up among several persons.

In very much the same way may the numerous and important rights in another's land (*jura in re aliena*), such as easements, profits, and the like, be regarded. Though falling far short of ownership of the land affected by them, they are true property rights, being protected from disturbance by any person whatsoever and not only by the owner of the land.

Here, then, we reach the outermost limits of property rights. Other rights there are affecting land or goods which do not attain the dignity of property. Of this nature is the right of the disseiser who is shut out of his land by an adverse possession, the right of entry for condition broken, the right to enforce a covenant running with the land, and the extensive class of rights known as equitable easements. These are all "mere rights," as the common law designates them, rights in personam, available against a specific individual, and not property rights, which are, strictly speaking, always rights in rem, asserted in the face of the whole world and capable of being infringed by any one who chooses to take the consequences.

The classification of property as *corporeal* and *incorporeal* is also peculiar to our legal system. Of course it has no rational basis. All rights are incorporeal, i.e., intangible, and the things which are the subject matter of property rights are usually tangible corporeal things. It may, indeed, be admitted that such property as advowsons, tithes, offices, and the like, as well as the more modern forms of property denoted by the terms "patent rights" and "copyrights," are incorporeal in the strictest sense of the term. But in Blackstone's use of the expression it includes easements, commons, and other profits à prendre, and all future estates in land, as reversions and remainders. Thus, the estate of a tenant for life or years is corporeal property, whereas that of the landlord, being for the time dissociated from the possession of the land itself, is described as incorporeal. But the classification was only a convenient expression for such interests in real property as "lay in livery" (i.e., were susceptible of physical control and therefore of delivery) and such as "lay in grant" and could be transferred only by deed and not by livery of seisin. It did not, therefore, aim at philosophic completeness and has never been extended so as to include personal property.

Only the most important of the incidents of property can here be referred to. Where ownership is absolute and undivided, the right to use and enjoy one's own, whether real or personal property, is limited only by the rule that requires a man to use his property in such ways as not to injure his neighbor. Where the ownership is divided, however, the right of enjoyment is hedged about with numerous and complicated restrictions and there is law of waste in the case of land, and of trover in the case of chattels, to protect the owner who is out of possession. Though now bound up with the very conception of property, the unlimited rights of alienation and of inheritance have not always been recognized by our law, even with respect to personal property. In the case of real property, particularly, those rights, now complete, were wrested with difficulty and only after many years of effort from the feudal system. The right to transmit lands by will was only conceded by Parliament in 32 Hen. VIII (1527).

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of the Law of Property in Land (2d ed., Toronto, 1909); T. E. Holland, *Elements of Jurisprudence* (11th ed., Oxford, 1910); E. H. Warren, *Select Cases and Other Authorities on the Law of Property* (Cambridge, Mass., 1915). For other incidents of property, see Emblements; Fixtures; Waste. For modes of acquiring property, see Accession; Alienation; Conveyance; Distribution; Grant; Inheritance; Occupancy; Will.

PROPERTY, or Proprium (in logic). See Predicable.

PROPERTY, Literary. See Literary Property.

PROPERTY, Real. See Real Property.

PROPH′ECY (OF. *prophecie, prophetie,* Fr. *prophétie,* from Lat. *prophetia,* from Gk. προφητεία, *prophēteia,* prediction, from προφητεύειν, *prophēteuein,* to predict, from προφήτης, *prophētēs,* prophet, from προφάναι, *prophanai,* to say before, from πρό, pro, before + φάναι, *phanai,* to say). According to the popular acceptation, prophecy is essentially prediction, a foretelling of events by divinely inspired personages. Inasmuch, however, as the general ideas on the subject are based upon religious phenomena in Hebrew history, it is but proper, in order to determine the exact force of the term and its development, to turn to Hebrew usage. Adopting this method, we find the earlier terms in Hebrew for "prophet" (e.g., *rō'eh,* seer, *khōzeh,* one who has a vision) associated with the prognostication of the future, and there is no reason to differentiate Hebrew prophecy in this stage from the belief common to all peoples in a low state of culture which assigns to certain individuals the power of ascertaining the will of the gods in whose hands the future of an individual or of a community lies. Such beliefs were common among Semites closely affiliated with the Hebrews. In Babylonia we find soothsayers, sorcerers, witches, and magicians recognized as necessary elements of society, and various classes of omen priests connected with the Babylonian temples; *kāhin,* the Arabic equivalent of the Hebrew word for "priest" (*kōhēn*), is used to designate the soothsayer. The various classes of soothsayers enumerated in Deut. xviii. 9–14 show not only the prevalence of this belief among the Hebrews up to a comparatively late period, but also the power which the soothsayers continued to exercise even after the Hebrews had entered upon a line of religious development destined to mark them off sharply from their fellow Semites.

The Hebrew prophet accordingly traces his origin back to the seer, i.e., to the magician, sorcerer, and soothsayer; if he stands out in history as a personage distinct from the seer, it is because there is afterward added in his case a quality of a higher order. It is not difficult to determine what this quality is. In the proper historical sense the term "prophet" is applicable only to the series of teachers and exhorters who arose among the Hebrews in the eighth century B.C. and through whose influence a new conception of the relation of the national god Yahwe to his people was evolved. While also concerned with prophecy in the sense of foretelling the future, they dealt, not with individuals, but with nations, and primarily with Israel and Judah. More than this, the prophetic functions which they exercised, or claimed to exercise, were incidental to their main task, which was to impress upon the people the sense of responsibility for their acts to a deity who governed, not by caprice, but by high standards of right, purity, and justice, and who was therefore to be approached, not by gifts and sacrifices, but by a contrite heart and a genuine spirit of devotion. It is significant that so many of these prophets should have opposed the sacrificial cult and maintained that before the invasion of Palestine, in the wilderness period, no sacrifices were offered. The prognostications indulged in by those prophets of whose utterances we possess fragments in the prophetical division of the Old Testament are largely concerned with threats of divine punishment for disobedience to Yahwe's will and decrees. They are accordingly based upon the profound conviction of the prophet that wrongdoing is certain to be punished, and in this respect their prophecies differ essentially from the attempts of soothsayers and diviners to determine by means of omens and oracular devices the course that will be taken by events and to ascertain the will of the gods.

This view of the prophetical calling among the Hebrews applies to such prophets as Amos, Hosea, Isaiah, Micah, Zephaniah, Jeremiah, and Ezekiel. At the same time it must be acknowledged that, even in the case of these exhorters, survivals of the more primitive prophetic functions are to be discerned. While discarding the oracular methods of the soothsayers, they yet stand forth as interpreting certain signs and symbols in connection with Yahwe's purposes, and above all they claim, or are represented as claiming, to have had visions in which the future, generally of the nation, was revealed to them. No doubt it was this claim and the belief in their extraordinary powers that lent them a large measure of the influence that they exerted. And it is not necessary to assume that the prophets of the higher order no longer believed in the supernatural phases of their calling. They deeply felt that they were speaking in Yahwe's name, and they were essentially the children of their day in accepting the position that Yahwe made his will known to his people through certain individuals singled out for the purpose. After the exile there was a decided change of tone. In Isa. xl ff. a prophet speaks who comforts his people. Haggai and Zephaniah predict the downfall of the Persian world power and insist upon the importance of the temple cult. Malachi regards the failure of offering proper sacrifices to Yahwe and the criminal neglect and selfishness of the priesthood as the greatest of evils, and looks for a coming of Elijah from heaven to purge the sons of Levi that they may offer acceptable oblations. Joel emphasizes the importance of fasting, and in Zech. xiv. 17–19 the nations who shall not go up to Jerusalem to keep the Feast of Tabernacles are threatened with perpetual drought.

The importance of the great preëxilic prophets consists in their paving the way for a new and far higher conception of prophecy, which, subordinating the predictive element, made the prophet the moral and religious teacher par excellence. It was their emphasis upon Yahwe's ethical demands that clothed the word "prophet" with the significance it now has to us. Yet the postexilic prophets also added an element. In changed conditions they became comforters, holding out the prospect of a glorious future for Israel and for mankind, marked by the triumph of right and justice. This activity, culminating in Daniel (q.v.) and the apocalypses (see Apocalyptic Literature), developed a broad outlook upon the world and an intense concern about its future, which have also come to characterize our conception of a prophet. That the new era expected was closely bound up with strictly national ideals represents a natural limitation, the absence of which would have placed both the prophets and prophecy entirely beyond the intellectual and religious horizon of their times. As late as the advent of Jesus the Messianic period was bound up in the minds of the masses with the restoration of the Jewish kingdom, and though Yahwe long ere the days of Jesus had ceased to be a merely national deity, yet even the God recognized as supreme and single in the universe was bound by special ties to a particular people; and even when the Messiah was no longer pictured as an earthly king, the limitation of Hebrew prophecy appears in the position accorded to Jerusalem, which, as the chosen seat of the universal God, was to be the spiritual centre of mankind—the gathering place to which all nations would make pilgrimage.

The term *nabi*, prophet, is applied in the Old Testament to many persons before the eighth century B.C. That there is a marked difference between men like Samuel and Nathan, Elijah and Elisha, on the one hand, and Amos and Hosea, Isaiah and Jeremiah, on the other, cannot be denied. The former are prophets of a different character, standing far nearer to the old Semitic *kāhins*, who, more or less closely organized into a guild, differ from the ordinary representatives of the gods, the priests, only in not being attached to any particular sanctuary, but, passing from place to place, furnishing oracles to those who seek them out, and engaging in religious practices that are the outcome of primitive religious beliefs. Yet this difference must not be exaggerated. They are not far apart in their moral fervor, their political and social interests and their pessimism, and the same intensity of nature leads one group to violent action, the other to denunciation. The application of the term to Abraham and Moses is simply due to a projection of later conditions into the remote past. It is not easy to draw a line of demarcation between true and false prophets. The fulfillment of their predictions cannot be used as a criterion, since many of the prophecies of Isaiah, Jeremiah, and Ezekiel were not fulfilled. If denunciation of doom were made the test, as it was by Jeremiah in the case of Hananiah, the author of Isa. xl ff. would be a false prophet. The theory of imposture on the part of the so-called false prophets has scarcely any adherents at present among scholars. But it is generally recognized that the degree of sincerity and moral earnestness creates a distinction among prophets, whose eyes are riveted on the future, the tendencies discernible in human history, or the moral ideals, as well as among other men.

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PROPHET. See MANTIS.

PROPHET, FLAG OF THE. See FLAG OF THE PROPHET.

PROPHET, THE SHAWNEE. See TENSKWATAWA.

PROPHÈTE, prō̍'fât', LE. An opera by Meyerbeer (q.v.), first produced in Paris, April 16, 1849; in the United States, Nov. 25, 1849 (New York).

PROP'OLIS (Lat., from Gk. πρόπολις, bee glue, suburbs, from πρό, *pro*, before + πόλις, *polis*, city). A substance commonly known as bee glue, which is obtained by the domestic honey-bee from the buds and crevices of trees and is carried by the workers to the hive in the basket-like cavities on the tibial joints of the hind legs. It is resinous in its chemical composition, and varies with the tree from which it is collected. It is used at once to stop up crevices in the hives and to varnish the whole interior surface, as well as to glue movable portions fast; also in strengthening the attachments of combs, and if the latter are designed exclusively for honey the edges of the completed cells receive a thin coating. The flight hole is often made smaller by filling a part of it with masses of propolis, sometimes mixed with old wax. Bees of the Carniolan race gather the smallest quantities of propolis and those of the Tunisian race the greatest amount; on this account the former are better suited to the production of white-comb honey.

PROPON'TIS. The ancient name of the Sea of Marmora. See MARMORA, SEA OF.

PROPOR'TION (Lat. *proportio*, proportion, symmetry, analogy, from *pro*, before, for + *portio*, share; connected with *pars*, part). In mathematics, an equality of ratios. Thus, the ratio of 12 to 3 equals the ratio of 8 to 2; hence $12:3=8:2$ is a proportion. In general if $a:b=c:d$, a, b, c, d are said to be in proportion. An equality of several ratios, as $1:2=4:8=9:18$, is called a continued proportion. An equality between the products of ratios, as $\frac{2}{2}\cdot\frac{5}{7}=\frac{1}{7}\cdot\frac{10}{3}$, is called a compound proportion. In the proportion $a:b=c:d$, a, b, c, d are called the terms, a and d the extremes, and b and c the means. The term d is called the fourth proportional to a, b, c. In the proportion $a:b=b:c$, b is called the mean proportional between a and c, and c is called the third proportional to a and b. If one quantity varies directly as another, the two are said to be directly proportional, or simply proportional. For example, the price of a given quality of sugar varies directly as the weight; the price is then proportional to the weight. Thus, at 4 cents a pound 12 pounds cost 48 cents, and 4 cents : 48 cents = 1 pound : 12 pounds. If one quantity varies inversely as another, the two are said to be inversely proportional. For example, in general, the temperature being constant, the volume of a gas varies inversely as the pressure, and the volume is therefore said to be inversely proportional to the pressure.

A proportion, being an equation, can be solved so as to express any term by means of the other three. Some of the fundamental properties of proportion are: (1) the product of the extremes equals the product of the means; (2) the terms are in proportion by composition, i.e., if $a : b = c : d$, $a + b : a = c + d : c$ or $a + b : b = c + d : d$; (3) the terms are in proportion by division, i.e., if $a : b = c : d$, $a - b : a = c - d : c$ or $a - b : b = c = d : d$; (4) the terms are in proportion by composition and division, i.e., if $a : b = c : d$, $a + b : a - b = c + d : c - d$; (5) in a continued proportion,

$$\frac{a}{b} = \frac{c}{d} = \frac{e}{f} = k, \quad k = \left\{\frac{ma^n + pc^n + qe^n + \dots}{mb^n + pd^n + qf^n + \dots}\right\}^{\frac{1}{n}}.$$

The theory of proportion, often called in connection with applied problems the rule of three, or golden rule, is as old as Plato's time and was called by the Greeks ἀναλογία. Euclid in the fifth, eighth, and ninth books of the *Elements* gives a rigorous treatment of the subject, in which the magnitudes are regarded as either commensurable or incommensurable. At one time the word "proportionality" was used for proportion, the word "proportion" (*proportio*) being used for ratio.

Proportion in Fine Art. This has to do with the relative sizes of things represented or embodied in a design and, in a secondary sense, with the relative importance of certain passages of light and dark, or of color more or less powerful and effective. Thus, the composition (q.v.) may be marred by a disagreeable relation between the heights or the bulks of two figures, trees, rocks, buildings in a picture or in reality, or parts of a building, in which case they are said to be out of proportion. So in an ordinary house front, as on the street of a city, the proportion between the window openings and spaces between them, and between the window openings of one tier and those of other tiers, and between the cornice and the wall below, and between the stone-faced basement and the brick-faced wall between the basement and the cornice, may all be so judicious that the whole front becomes, by the combination of these different proportions, a remarkable work of art. Certain architects of great fame have had no other important claim to the consideration of posterity than a mastery of such proportions as these.

There is no fixed rule for proportion, nor even any body of rules for the government of those who would produce effective proportions in their design. It is true, however, that many attempted analyses have been made of fine designs, both in painting and in architecture, with a view of ascertaining the supposed principles which govern the designer in making admittedly beautiful compositions. For proportion in the fine arts, consult: E. E. Viollet-le-Duc, "Proportion" and "Symétrie," in *Dictionnaire raisonné de l'architecture* (10 vols., Paris, 1854–68); Robinson, *Principles of Architectural Composition* (New York, 1899); J. V. van Pelt, *A Discussion of Composition as Applied to Architecture* (ib., 1902); H. R. Poore, *Pictorial Composition and the Critical Judgment of Pictures* (ib., 1903); A. W. Dow, *Composition* (7th ed., ib., 1913).

PRO'PYLÆ'A (Lat., from Gk. προπύλαια, *propylaia*, neut. pl. of προπύλαιος, *propylaios*, before a gate, from πρό, *pro*, before + πύλη, *pylē*, gate). In classical Greek, a structure forming the architectural setting of the entrance to an important inclosure or group of buildings. The majority of those known to us by description or by their remains comprised usually a portico, a roofed hall, and one or more doorways leading into the citadel or temple inclosure. The plans and style of those at Eleusis, Epidaurus, Priene, and some other Grecian towns have been clearly ascertained. The plan of that at Athens, by far the grandest of all, has aroused much discussion by reason of its two unequal wings. Professor Dörpfeld has suggested that it is an incomplete carrying out of a design for a symmetrical edifice, and there are many indications to support this theory. Its ruins are sufficient to permit a correct restoration, and certain parts are well preserved, especially the columns of the inner and outer porticoes. The entire structure provided a stately entrance into the sacred inclosure on the top of the Acropolis rock. A solid wall with five doorways, large in proportion to the piers between them, formed the gateway proper, with a hexastyle Doric portico on the east facing the Acropolis inclosure. A hall, roofed with stone and divided into three aisles by two rows of Ionic columns, six in all, intervened between these five doors and the outer or western portico of six Doric columns. This was flanked by two smaller projecting wings facing each other, each of these with three Doric columns *in antis*. The whole propylæa is in its principal mass about 75 feet square, while the width across the wings is about 150 feet. No other Greek example rivals that of Athens in size and dignity. It was the work of Mnesicles (q.v.), and dates from about 432 B.C. The name "Propylæa" has been applied to several modern gateways, particularly to two in Germany—the Brandenburger Thor at Berlin, by Langhans (1788), and that at Munich, designed by Von Klenze. Consult: E. A. Gardner, *Ancient Athens* (new ed., New York, 1907); M. L. D'Ooge, *The Acropolis at Athens* (ib., 1908); C. H. Welles, *Athens and its Monuments* (ib., 1913).

PROSAU'RIA, PROSAU'RI (Neo-Lat. nom. pl., from Gk. πρό, *pro*, before + σαῦρος, *sauros*, lizard). A subclass and order, respectively, of reptiles, extinct except the genus *Sphenodon*, with one living species, the tuatara (q.v.). They are represented mostly by Permian and Carboniferous fossils. The subclass contains two orders, Microsauri and Prosauri; and the latter two suborders, Protorosauri and Rhynchocephali. These "seem to represent the central stem of the reptilian tree," and the latter has a survivor in *Sphenodon*. Consult Gadow, *Amphibia and Reptiles* (London, 1901).

PROSCOR'PIUS. A fossil form of scorpions, of which *Proscorpius osborni* is the earliest known in America. It occurs in the Bertie water lime of New York, but other Silurian scorpions occur in Sweden and Scotland. The legs of these ancient scorpions terminate in sharp points and are without claws. They may have been marine animals. See SCORPION.

PROSECU'TION (Lat. *prosecutio*, from *prosequi*, to follow, from *pro*, before, for + *sequi*, to follow). In its technical legal sense, the institution and conduct of legal proceedings against one who is charged with a crime. In a more general sense it is sometimes used as applicable to civil as well as criminal proceedings. There are three methods of prosecution for crime: first, upon the unsworn complaint of an individual; second, upon the complaint of an officer appointed to institute prosecutions; and third, upon a sworn complaint. The first was the earliest method known to the common law, and was, in England, a permissible method of prosecution under the technical name of appeal as late as 1818. (See APPEAL.) The second method obtains in some European countries, but not in England or the United States, where the third method of prosecution, upon sworn complaint, is now used exclusively.

Prosecution by sworn complaint may be instituted on the complaint of a private individual or on that of the attorney-general or other prosecuting officer, when the complaint is said to be on information; or it may be instituted directly by the grand jury, which makes its complaint in the form of an indictment (q.v.) or presentment (q.v.). When made by a private citizen the practice is to file the complaint in the court of a justice of the peace or magistrate, whose duty it then is to issue a warrant for the arrest of the person charged with the crime. When a person has been arrested upon complaint or by a peace officer or other person having authority, he is arraigned before a magistrate, who may hold him for the action of the grand jury or for trial by the proper court upon information filed by the prosecuting officer. When, however the accused is a fugitive from justice, the information may be filed without the preliminary examination, and an indictment may be found or presentment made by the grand jury before arrest. Whether the accusation is by information or indictment, the accused when arrested is required to plead to the information or indictment and is then placed upon trial in the court having jurisdiction. For the other proceedings in a criminal prosecution, see ARREST; GRAND JURY; INDICTMENT; PLEADING; PROCEDURE; PROSECUTOR.

PROSECUTION, MALICIOUS. See MALICIOUS PROSECUTION.

PROS′ECUTOR (Lat. *prosecutor, prosequutor,* from *prosequi,* to follow). One who institutes and conducts a criminal prosecution in behalf of the government.

In most European countries the duty of conducting prosecutions for criminal offenses is imposed on public officers. In England it has been customary for all criminal prosecutions to be conducted by private citizens, except in rare cases of crimes directly affecting the sovereign, when the prosecution was conducted by the Attorney-General. In cases of private prosecution in England the person instituting the proceeding is usually required to give a bond conditioned upon his proceeding with the prosecution. He can be relieved from his obligation only by the court or on the entry of a *nolle prosequi* by the Attorney-General. The prosecutor is required to bear all the costs of the prosecution, but the court will usually award him a sum sufficient to cover his necessary expenses.

In 1879 an Act of Parliament (47 and 48 Vict., c. 54) "more effectually providing for the prosecution of offenses in England" was framed which enacted that the Secretary of State might from time to time appoint an officer called the Director of Public Prosecutions, whose duty it should be to institute and carry on prosecutions under the direction of the Attorney-General. The authority of this officer, however, was somewhat limited, and it is still true that under the English system there is no officer whose duty it is to prosecute for all crimes.

In the United States, while prosecutions by private individuals are permissible, they are in practice rarely resorted to. Under both the Federal government and the several State governments provision is made for the prosecution of offenders by public prosecutors usually known by the title of district attorney (q.v.).

The prosecuting officer's authority is confined to the preparation and trial of cases. He cannot stipulate for exemption from punishment or as to the amount of punishment which shall be inflicted, although his recommendations are often accepted and acted upon by the court. In most States, but not all, he may with leave of the court accept the assistance of private counsel, but he still remains the responsible instrument of the law. He may, if the evidence or facts within his knowledge justify in his judgment the step, enter a *nolle prosequi,* thus ending the present prosecution, but not barring the right to institute a new prosecution on the obtaining of further proof. In some States he must obtain the consent of the court to do this.

Besides district attorneys, there are in many States special prosecutors appointed to conduct prosecutions in police and other minor courts with more restricted power than that of district attorneys. Special prosecuting agents are also sometimes appointed to prosecute for violations of the liquor laws. See INDICTMENT; INFORMATION; JEOPARDY; NOLLE PROSEQUI; ETC.

PROS′ELYTE (Lat. *proselytus,* from Gk. *προσήλυτος,* convert, one who has come over, from *προσελθεῖν, proselthein,* to have come towards, from *πρός, pros,* towards + *ἐλθεῖν, elthein,* to have come). A convert, generally to a new religion. In the Greek version *προσήλυτος* is the usual translation of the Old Testament term *gēr,* i.e., one who takes up his residence in a foreign land and puts himself under the protection of a foreign people. It is applied more particularly to the foreigner residing in Palestine, but in the New Testament is the name given by the Jews to a convert to Judaism. The transition, however, from the former to the latter meaning is already foreshadowed in certain parts of the Old Testament, such as, e.g., Num. xv. 14–16, 29, 30 and Isa. xiv; but it was not until the second century B.C. that the term "proselyte" seems to have fully acquired its technical sense. According to Jewish law circumcision was an essential preliminary to admission into the synagogue as a member. The proselyte is therefore a *gēr* who has been circumcised. By the side of the proselyte in the full sense, however, there were two classes of persons to whom the term *gēr* would naturally be applied, pagans sojourning in Israel's land and sympathizers with Judaism, in Palestine and elsewhere, who had adopted some Jewish customs, such as Sabbath keeping and certain dietary laws, and had proclaimed their belief in monotheism. Of the former the *gēr toshab* (Lev. xxv. 47) was used. Theoretically these sojourning foreigners were regarded as subject to the seven Noachic commandments, but practically this demand could not, of course, be enforced. Among them some were God-fearing ones, and by virtue of the soil he had carried with him to Damascus Naaman was therefore called a *gēr toshab* (*Gittin* 57 b, *Sanhedrin*

96 b). In the time of Nachmanides (thirteenth century) they were called *gere sha'ar* (proselytes of the gate). The sympathizers were called *σεβόμενοι τὸν Θεόν* (the God-fearing ones). This term is often used in Acts, and Josephus (*c. Apion*, ii, 10) calls the Empress Poppæa *Θεοσεβής*. There was an active missionary propaganda, not only in the Hellenistic world, as may be seen in Philo (*De Humanitate*, ii, 405 ff.), Josephus (*Bellum Jud.*, ii, 202), Horace (*Sat.*, i, 9, 691), Persius (*Sat.*, v, 179 ff.), and Seneca (in Augustine, *Civ. Dei*, vi, 11), but also by Palestinian rabbis, as is shown by Matt. xxiii. 15 and the story of the conversion of the royal house of Adiabene (q.v.). In the last case Ananiah is willing to forego the demand for circumcision, while Eliezer insists upon it.

The full proselyte, known in rabbinical literature as *gēr ṣedeḳ* (proselyte of righteousness), in addition to submitting to the rite of circumcision had to receive instruction in the texts of Judaism and usually was obliged to carry out the precepts strictly. He was obliged to cut loose from heathen associations altogether, and after a certain time the ceremony of baptism, or the ritualistic bath to symbolize his purification from the uncleanliness of heathenism, was also insisted upon. The testimony of Yebamoth 47b renders it extremely probable that baptism of proselytes was in vogue before the Christian era, that it was practiced in the case of women, and that it was demanded in the case of men even when circumcision was not required.

A part at least of the Hellenistic Jewish literature is distinctly intended for heathen readers, written to convince them of the falsity of their own religion and of the superiority of Judaism. To be sure, the Judaism advocated in this literature was no longer a pure product and itself shows traces of the influence of Greek thought; yet in its main lines it was in keeping with the doctrines and tendencies of Palestinian and Babylonian Judaism. As a result of these proselytizing tendencies Christianity found the way opened when the new religion felt strong enough to begin active missionary efforts; and in the measure that the Jewish Christians abandoned distinctively Jewish customs and rites, they attracted many to their ranks who had been prepared for the new faith by the dissemination of Hellenistic thought. In this manner Christianity reaped the benefits of the labors of the Jewish propagandist and became essentially a missionary religion. Judaism also continued to make converts, as the history of the Khazar Jews seems to show. But it gradually became characterized by a decided discouragement of additions to its ranks, increasing its restrictions and surrounding admission into the synagogue with difficulties that only a very limited number could overcome.

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PROSENTERON, prŏs-ĕn′tẽr-ŏn. See ALIMENTARY SYSTEM, EVOLUTION OF THE.

PROSER′PINA (Lat., from Gk. *Περσεφόνη*, *Persephonē*, *Περσεφόνεια*, *Persephoneia*, of unknown etymology). In Greek mythology, the daughter of Zeus and Demeter. (See CERES; ENNA.) In Homer she appears as the dread consort of Hades (q.v.; see also PLUTO), the ruler of the lower world and enemy of life. With this probably belongs the genealogy that made her daughter of the Styx. This side is, however, far more prominent in literature and art than in the cult. In imprecations her name is frequently invoked along with those of Hades and the Furies, who in Orphic theology (see ORPHEUS) are even called her daughters. So she rules the dead, and death comes in obedience to her command, while it is as her servant that Hermes leads the souls to her kingdom. Not that she is always stern, for in the story of Orpheus and Eurydice and in that of Alcestis she appears as moved to pity. In art, when with her mother, she is sometimes represented as of more girlish form, but even here she carries the torch of the goddess of the lower world. When represented with Hades she is altogether the queen, commonly enthroned, and holding the sceptre, or sometimes the bunch of wheat, which conveys a reminiscence of her gentler function. Consult the bibliography under CERES, and C. M. Gayley, *The Classic Myths in English Literature and in Art* (2d ed., Boston, 1911).

PROSKUROV, prŏ̇′skụ-rŏ̇f′. A district town in the Government of Podolia, Russia, situated near the Bug, about 60 miles north of Kamenetz-Podolsk (Map: Russia, C 5). It has an extensive sugar mill and manufactures of flour and tobacco. Pop., 1910, 40,611.

PROSODY, prŏs′ŏ̇-dĭ (Fr. *prosodie*, Lat. *prosodia*, from Gk. *προσῳδία*, from *πρός*, *pros*, towards + *ᾠδή*, *ōdē*, song, from *ἄδειν*, *adein*, to *sing*). A term which originally meant the tone or accent of a syllable, and later was applied to a song sung to music. At the present time it is loosely regarded as that part of grammar which treats of quantity, accent (q.v.), and the laws of versification (q.v.).

PROS′PECTING. See MINING.

PROSPECT PARK. A borough in Passaic Co., N. J., adjoining the city of Paterson, on the Passaic River. It is a residential suburb of the neighboring city. Pop., 1910, 2719.

PROSPECT PARK. See BROOKLYN.

PROSPECTS. See MINING.

PROS′PERO. The banished Duke of Milan in Shakespeare's *Tempest*, a wise and noble magician living on a desert island with his daughter Miranda.

PROS′PER OF AQUITA′NIA, SAINT (c.400–c.463). A learned layman of the fifth century, born in Aquitania. Little is known of his life except that he was in Gaul from 428 until 434 and after that date probably lived in Rome. It was he who induced Pope Celestine to write a letter to the bishops of Gaul expressly confirming St. Augustine's doctrine of grace, and he was recognized as the accredited defender of the Church's teaching on the subject against the Semi-Pelagians. His *Chronicle* (called *Chronicon Consulare* to distinguish it from another called *Chronicon Imperiale*) was completed in Rome. It is a continuation of that of Jerome and brings it up to 455, dealing especially with the history of dogma and of heresies. His works, from the Benedictine text of 1711, are in Migne, *Patrologia Latina*, li. For his teaching on grace, consult Wörter, *Prosper von Aquitanien über Gnade und Freiheit* (Freiburg, 1867).

PROS′SER, CHARLES ALLEN (1871-). An American educator, born at New Albany, Ind. He graduated at De Pauw University in 1897, took the degree of LL.B. at the University of Louisville the next year, and in 1915 the Ph.D. at Columbia University. He was superintendent of schools in New Albany from 1900 to 1908, until 1910 occupied a similar position in connection with the Children's Aid Society of New York, and thereafter, as Deputy Commissioner of Education of Massachusetts, devoted himself to the introduction and organization of vocational and industrial education in that State. From 1912 to 1915 he was secretary of the National Society for the Promotion of Industrial Education, and in the latter year was appointed director of the Dunwoody School, an institution founded in Minneapolis to provide industrial education. Prosser is the author of the *New Harmony Movement* (1903); *Organization and Administration of Vocational Education* (1913); *The Teacher and Old Age* (1913); and of many pamphlets and monographs on vocational education.

PROSSNITZ, prŏs′nĭts (Boh. *Prostějov*). A manufacturing town of the Crownland of Moravia, Austria, in the fruitful plain of Hanna, 11 miles southwest of Olmütz (Map: Austria, E 2). It manufactures woolen cloth, cashmeres, malt, sugar, brandy, agricultural implements, linen, and cotton stuffs. Pop., 1900, 24,054; 1910, 34,100, mostly Czechs.

PROS′TATE GLAND (from Gk. προστάτης, *prostatēs*, one who stands before, from προϊστάναι, *proistanai*, to stand before, from πρό, *pro*, before + ἱστάναι, *histanai*, to stand). A pale, firm, chestnut shaped, glandular body, surrounding the neck of the bladder and the beginning of the male urethra. The prostate gland secretes a milky fluid, which has an acid reaction and when examined with the microscope shows columnar epithelium with granular nuclei, and which is discharged into the urethra at the time of the emission of the semen, and acts as its vehicle. In old age it is liable to become enlarged, and it is also sometimes the seat of various diseases. Inflammation of the organ, acute or chronic, occurs most frequently as the result of gonorrhœa. Abscess may happen either as the result of acute inflammation or it may occur with comparatively little antecedent inflammation, as in pyæmia. Prostatitis is liable to produce retention of urine, either from inflammatory exudation or from the pressure of the congested organ. In such cases the urine must be drawn from the bladder by a catheter. In rare cases there is excessive growth of the glandular element, and sometimes tumors develop. The gland is sometimes the seat of cancer as well as of tubercle. Prostatic calculi may occur, usually in old people, more rarely in young subjects. Prostatorrhœa is the excessive secretion and discharge of the characteristic milky secretion of the gland and occurs in neurasthenic individuals. Prostatic hypertrophy is treated surgically by removal of the organ entirely or in part, the operation constituting prostatectomy. It is a grave operation. Consult Da Costa, *Modern Surgery* (7th ed., Philadelphia, 1914).

PROSTITU′TION (Lat. *prostitutio*, from *prostituere*, to expose publicly, to place before, from *pro*, before, for + *statuere*, to place, from *stare*, to stand). Customary and common practice of lewdness for hire. Prostitution appears to have arisen in every race upon its emergence from the semipromiscuity of barbaric life; certainly no highly civilized people has ever been free from it. While it may thus be regarded as universal, it is not, however, a constant phenomenon, since its volume has unquestionably shown great tendency to variation.

The causes of prostitution are too complex for enumeration, but its principal conditions may be briefly indicated. It is most common where large classes of men live under conditions which do not admit of the founding of families, and where numerous women exist in so degraded an environment that they are not greatly influenced by the social abhorrence for professional vice. These conditions are fulfilled in most large cities, and for this reason it is not unnatural that prostitution has increased in the last century, since the proportion of the population living in cities has greatly increased. (See POPULATION.) It may therefore be regarded as a phenomenon of social pathology, since it is closely dependent upon the social grouping of population and distribution of wealth. It may be pointed out that the use of alcoholic beverages increases the number who live by vice, not only by increasing the attractiveness of such a life, but by creating in many homes conditions of so degraded a character that young children are early familiarized with evil. Recent changes in the mode of life of a large part of the race have no doubt given rise to many forms of physical degeneracy which naturally find expression in this form of vice. Further, the fact that a great deal of money finds its way into the hands of the prostitute renders it inevitable that a class of individuals should arise who make it their business to provide opportunities for vicious indulgence and to secure new victims for prostitution; and although there is no foundation for the popular belief that systematic procuration is responsible for the greater number of prostitutes, it remains true that in many cities there have existed and still exist agencies for procuring unwilling victims for vice.

Attempts to repress prostitution by penal laws have been common in all nations which have developed a high standard of personal purity. Such attempts were frequent in Jewish history. Prostitution was intimately associated with the worship of certain pagan deities (e.g., Astarte), and was therefore more severely punished than a mere moral offense would have been. In the early Germanic tribes prostitution, like any other form of unchastity, was severely punished as an offense against social and religious institutions. The conquest of the Roman Empire by Christianity resulted in the promulgation of repressive laws against prostitution. By the capitularies of Charlemagne whipping, imprisonment, and exposure were imposed upon the prostitute and those who sheltered her. Repressive enactments appear frequently in the later Middle Ages, especially after the great epidemic of syphilis in the fifteenth and sixteenth centuries, when many states and cities adopted the harshest measures of repression, employing imprisonment, mutilation, and even capital punishment to this end. Upon her accession to the throne of Austria, Maria Theresa entered upon a systematic policy of repression, punishing severely both the prostitute and those who consorted with her. Repressive policies still appear sporadically in both Europe and America, but the inherent difficulties of police control of morals, together with the fruitlessness of past repressive policies, prevent their general adoption.

As an alternative to repressive measures many governments have adopted the policy of tolerating prostitution itself, but under such regulations as might divest it of its attendant evils. These may be classed as social and hygienic. The social effect which was earliest recognized was its tendency to lower the general standard of morals and thus to impair the integrity of the family and to undermine the whole constitution of society. Classical and mediæval regulation endeavored to meet this evil by drawing a clearly defined line between women devoted to vice and those of honorable life. The prostitute was compelled to live in special quarters and to wear a distinguishing garb. The same spirit evidently lies at the basis of modern police regulations, common in German cities and not uncommon in America, creating a reservation within which prostitutes may live unmolested. It is assumed that when scattered among the general population prostitutes act as centres of contagion of moral disease. In small cities such regulations have proved effective in centralizing vice, although grave doubts have been cast upon the social expediency of such a policy; and in large cities it has never proved satisfactory even to those who are convinced of the expediency of regulation.

A second social result of prostitution is the encouragement and opportunity it gives to crime. The prostitute and the criminal come to a large extent from the same social classes. The female members of criminal families are frequently prostitutes. Moreover, the fact that both classes are social outcasts tends to bring them into sympathy with each other. Many prostitutes form semipermanent relations with low criminals (*souteneurs*, cadets) and support them in the intervals of their criminal enterprises. The brothel furnishes easy opportunity for robbery and theft. To break up this alliance between vice and crime has been one of the constant endeavors of those who seek to regulate prostitution. In the Middle Ages it was a common practice to form quasi-guilds of the prostitutes, imposing upon them collective responsibility for all violence and disorder that might occur in the brothel. The present policy of the French police is to force prostitution, so far as possible, into brothels, the owner or tenant of which may be made responsible for crime. One of the purposes of the plan of confining prostitution in reservations is the greater ease of police supervision that may result from lessening the area in which prostitution operates.

The hygienic effects of prostitution, however, have attracted far more attention from modern students of the problem than the social effects. Prostitution has always been the source of serious contagious maladies, but in early times, owing to the backwardness of medical science, the relation between disease and vice was hardly recognized. The appearance in Europe of syphilis (q.v.) in epidemic form drew attention to this relation. In 1700 the Berlin authorities adopted the plan of periodic examination of prostitutes, with confinement in hospitals of the diseased, a policy now generally known as reglementation. A similar plan was put into systematic operation in Paris in 1802, and during the first half of the nineteenth century was widely adopted in other European cities. The great majority of the large cities of continental Europe pursue the same policy at the present time. Sanitary control of prostitution received an extended trial in England under the Contagious Diseases Acts, in operation from 1866 to 1883 in 12 stations in England and 2 in Ireland. A modification of the same plan was tried in America in St. Louis (1870–73). In parts of Japan reglementation is the accepted method of dealing with vice. The ideal of reglementists is to compel every person devoted to professional vice to submit to periodic inspection for signs of disease. In Paris, which may be selected as typical of cities in which reglementation is well established, inmates of brothels are inspected weekly at their place of residence. These form only an insignificant fraction of the total number. The great majority live in furnished rooms, and are required to report twice a week at the dispensary. Each prostitute who submits to control is given a card which frees her from molestation unless her conduct is flagrantly disorderly. A register is kept of tolerated prostitutes, and when once enrolled upon the register they cannot be freed from the obligation of periodic inspection except upon evidence of a change in their mode of life. If they are found to be diseased, they are sent to the hospital of the prison of St. Lazare, where they are detained until cured.

Registration may take place at the request of the prostitute, or by order of the official head of the Morals Police, a body of police set apart especially for this service. Inasmuch as probably the majority of prostitutes regard their state as only temporary, expecting to return to honorable life sooner or later, they usually resist strenuously the efforts of the police to place them upon the register, since they believe that the register may be employed at any time in their lives to brand them with infamy. The chance of detention for months in a prison hospital in order to be cured of a malady which causes little suffering is another deterrent to the acceptance of police toleration. For these reasons the police are forced, by frequent arrests and imprisonment, to render the position of the unregistered or clandestine prostitute as unsatisfactory as possible; and frequently the office finds it necessary to register prostitutes against their will. In spite of the incessant activity of the police, the number of those who are found on the register is only a small minority of the total number of prostitutes—not over 25 per cent and probably nearer 10 per cent. What is true of Paris is true in the main of most other cities in which reglementation is practiced. In Berlin the police act with somewhat greater freedom in registering prostitutes against their will, but succeed in subjecting no very large percentage to control. The difficulties in the way of control are less in the smaller cities, and it is claimed that in some towns, e.g., Dorpat in Livonia, clandestine prostitution has been practically eradicated. This is, however, but very rarely the case, and no supporter of reglementation is optimistic enough to hope for equal effectiveness of control in large cities.

It is almost impossible to form a just estimate of the effect of reglementation in checking the spread of venereal maladies. Until the close of the nineteenth century it was generally believed that statistical evidence existed which demonstrated clearly the sanitary advantages of reglementation. Those statistics have since been subjected to careful analysis and have been proven to be practically worthless. Defenders and opponents of the system have practically agreed to discard statistical arguments and to rely upon common sense to defend their positions. If, as seems probable, the system increases the extent of indulgence in vicious pleasures through creating a popular impression that vice is innocuous, it is not inconceivable that reglementation, as at present practiced, increases disease instead of diminishing it. The system is attacked on the grounds, (1) that it legitimatizes vice and encourages it by the attempt to make it innocuous; (2) that it is in violation of the principles of personal liberty, since it creates a class of persons over whom the police have practically unlimited power, and permits the police, on mere suspicion, to subject individuals to arrest and an insulting inspection; (3) that it tends to render difficult or impossible the reform of those who have once fallen into vicious habits of life; and (4) that it increases instead of checking the extent of disease. Furthermore, it creates a popular impression that prostitution is a necessary evil, and thus acts as a check upon efforts to prevent its increase and to assist fallen women to rise from their dishonorable vocation.

How far the charges of the abolitionists are true it is impossible to say. A conservative view is that little good results from reglementation, possibly no more than could be gained by the now discredited policy of penalizing prostitution. Permanent amelioration of public health and morals depends upon limiting the absolute extent of vice. To this end repression may contribute in a considerable measure, though complete success is not to be expected. In the chief American cities the police technique of repression has been greatly improved since 1900. The "Injunction and Abatement" principle, first appearing in an Iowa law of 1909, makes it possible for any citizen to secure the closing of a disorderly house through appeal to the courts, thus depriving the police of power to license or segregate prostitution without warrant of law. Commercialized vice received a serious blow from the adoption in 1904 by 13 nations of a treaty for the suppression of the international white slave trade, and the adoption in 1910 of the Mann White Slave Act, penalizing the transportation of women for immoral purposes in interstate traffic, made possible restriction of procuring in the United States. Organized efforts have been made, both in Europe and the United States, to educate the public to the dangers of venereal disease. This work is undertaken in America by the Society of Sanitary and Moral Prophylaxis, organized in 1906. There can be little doubt that a greater regard for the welfare of neglected minors in the large cities would diminish the number of those who live by vice. Houses of refuge for those who desire to reform are now quite common. Such institutions have not hitherto been as successful as was expected. Investigation has shown that not more than 5 per cent of the inmates of some of these Magdalen houses were permanently reformed. This has been due in part to the fact that such homes, founded by religious organizations, assumed that the reformed prostitute was to live a life of severe penance. Institutions which have aimed merely to offer a temporary refuge, and have sought to secure the return of the prostitute to an honorable place in society, have been far more successful. Societies for the rescue of girls who have fallen into the hands of professional procurers are also becoming prominent, and have already effected much towards the suppression of this form of slave trade.

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PRO′STYLE (Gk. *πρόστυλος*, *prostylos*, having columns in front, from *πρό*, *pro*, before + *στῦλος*, *stylos*, column). A temple with a portico in front. A temple with a portico at both ends was termed amphiprostyle. See Greek Art, *The Temple*.

PROTAG′ORAS (Lat., from Gk. Πρωταγόρας) (c.485–c.411 B.C.). A famous Greek sophist of the fifth century B.C., born at Abdera, in apparently humble station. He came to Athens as early as 445 B.C., and in that city and in Sicily won his fame as a teacher and philosopher. About 411 B.C. he was charged with impiety because of his agnostic writings and was forced to flee into exile. He met his death by drowning in the Sicilian Sea. Protagoras was the first to call himself a sophist (see SOPHISTS) and to teach for pay. His instructions were valued so highly that tradition reports that he received as much as 100 minæ ($1800) from a single pupil. He enjoyed the intimate friendship of Pericles and won great reputation by his brilliancy and skill. His chief works were entitled *Truth* (Ἀλήθεια, or Ἀντιλογικά) and *On the Gods* (Περὶ τῶν Θεῶν). His doctrine was a form of agnosticism, which declared that there was nothing absolutely good or bad—that characterizations of things and actions as good and bad are based simply on convention; hence it follows that each individual is his own final authority. This teaching is summed up in his saying "Man is the measure of all things." Protagoras further turned his attention to grammar and the explanation of difficult passages in the poets; the distinction of genders and moods is also attributed to him. Consult: Erdmann, *History of Philosophy*, English translation, vol. i (New York, 1892); Eduard Zeller, *Philosophie der Griechen*, vol. i (5th ed., Leipzig, 1892); Theodore Gomperz, *Greek Thinkers*, vol. i, English translation by L. Magnus (New York, 1905); W. Windelband, *Grundriss der antiken Philosophie* (3d ed., by A. Bonhöffer, Munich, 1912); Ritter and Preller, *Historia Philosophiæ Græcæ* (9th ed., Gotha, 1913).

PRO'TAN'DRY. See POLLINATION.

PRO'TEASE. See DIGESTION IN PLANTS.

PROTEC'TION (Lat. *protectio*, from *protegere*, to protect, cover over, from *pro*, before, for + *tegere*, Gk. *στέγειν*, *stegein*, Skt. *sthag*, to cover, Lith. *stógas*, roof, OIr. *teg*, house, OHG. *dah*, Ger. *Dach*, AS. *þæc*, Eng. *thatch*). The term applied to the policy of encouraging and developing home industries by means either of bounties paid to home producers or of duties imposed upon goods imported from abroad. The encouragement afforded by bounties is so direct and certain that they have been preferred to duties by many writers, including Alexander Hamilton. Nevertheless they have been little used in practice, because of their cost and of administrative difficulties connected with them. The latest examples of the use of bounties are afforded by the sugar bounty provided in the United States tariff of 1890 (the McKinley Act) and the export bounties on the same commodity paid by Germany and some other European states. The former remained in force only four years, while the latter have been abrogated except in the case of Russia by the Brussels Sugar Convention.

Import duties serve to encourage home industries under the following circumstances: they must apply to goods that may be produced within the country imposing them; they must not be offset either by reductions in the export prices of the commodities taxed or by internal-revenue duties on the same commodities produced within the country; finally, they must serve to raise the prices of the taxed articles in the home market sufficiently to make their home production profitable. Given these conditions, a duty is increasingly protective according to the completeness with which it excludes the foreign producer from the home market. Its purpose is directly opposed to the acquisition of revenue, since it becomes perfectly protective only when it prohibits all importation, i.e., ceases to afford any revenue whatever. It is for this reason that highly protective tariffs need to be supplemented by revenue schedules and even internal-revenue duties to satisfy the fiscal requirements of modern governments. See TARIFF.

The policy of protection does not differ outwardly from the restrictive policy advocated by the mercantilists (see MERCANTILISM), but is defended on grounds quite independent of their erroneous balance-of-trade theory. As pointed out elsewhere (see FREE TRADE), protection is the policy practiced by most of the governments of the world. In this article attention will be directed to protection as it has been applied in the United States. Arguments similar to those reviewed are advanced in justification of the policy in other countries, and there is therefore no occasion to repeat them.

When the American Colonies gained their independence, free exchange with the mother country was the policy advocated on all sides. The restrictive measures put in force by England herself after 1783 made the realization of this ideal impossible and fostered a sentiment in favor of protection to home industries as a means of rendering the United States industrially, as it had become politically, independent. Tariffs passed by Massachusetts and Pennsylvania in 1785–86 reflect clearly this protectionist attitude, as does the first national tariff passed in 1789. There was still some misgiving as to whether the country was adapted to manufacturing, however, and the first Secretary of the Treasury, Alexander Hamilton, was asked to submit to Congress a report on manufactures, together with recommendations to guide its future policy.

The famous *Report on Manufactures* was submitted in December, 1791, and has remained down to the present day one of the most important documents in the literature of protection. Hamilton concluded that in the light of the actual situation a moderate protective policy designed to build up within the country all the industries necessary to national independence and to the most rapid development of natural resources was advisable. In coming to this conclusion he ascribed great importance to England's restrictive policy, and said repeatedly that but for these restrictions a freer policy on the part of the United States might be desirable. He also emphasized his conviction that industrial independence is indispensable to continuous political independence and that it is the part of wisdom for a new country to foster within its borders, even at considerable sacrifice, the industries necessary to a complete national life, not forgetting those concerned with the munitions of war.

During the years immediately following the completion of Hamilton's report the situation was so favorable to the development of the shipping industry of the United States that little attention was given to the question of protection. The Napoleonic wars made shipping under the flag of a European state hazardous and gave America, as the only important neutral country, the lion's share of the world's carrying trade. While this condition continued shipping and commerce flourished in an unprecedented fashion. The situation was abruptly changed by Napoleon's Berlin Decree and the British Orders in Council of 1806–07, which set up a paper blockade of all important European ports and deprived American merchant vessels of the immunity which they had previously enjoyed. The United States retaliated with the Embargo (1807) and the Nonintercourse Act (1809), and finally became involved in the War of 1812. From 1807 to 1815, in consequence of these difficulties, the United States was more nearly isolated industrially than ever before or since. Foreign trade was almost entirely suspended and the country was forced to produce for itself nearly all the commodities which it required. It was during this period that manufacturing first developed to the position of an important American industry. When it ended the industrial situation was so different from that described by Hamilton that the whole question of protection assumed a new aspect.

The Tariff Act of 1816, the first out-and-out protective tariff that the country had known, was defended more on the ground of protecting industries already established than of building up new industries. In fact the highest duties provided were to remain in force only three years, since it was believed that by that time manufactures would be adjusted to the conditions of peace and able to hold their own against foreign competitors. The erroneousness of this view was soon demonstrated, and succeeding tariffs continued the protectionist policy, although with modifications, down to 1857. During this period the vested-interests argument, the home-market argument, and the infant-industry argument were those most frequently urged in support of protection. The vested-interests plea needs no explanation. It is always urged by conservative people in favor of the continuance of an established policy and does not pretend to throw any light upon the expediency or inexpediency of the policy itself. The home-market argument, as advanced by Henry Clay, the father of the American system, as protection began to be called, was designed to reconcile the interests of the agricultural South and West with those of the manufacturing North. It rested upon the proposition that the prosperity of the American farmer depends upon a regular and constant market for his products and that such a market is to be obtained only by building up manufacturing centres within the country. The experience of the years from 1816 to 1825 was cited to prove that the foreign market was not to be depended upon, and farmers were exhorted to unite with manufacturers in establishing a system which should bind different sections of the country together by furthering the interests of all. To the greater stability claimed for the home market—a quality now seriously questioned by economists—later analysis has added another merit. The home market calls not only for the stable products which will bear ocean transportation, but also for all kinds of perishable goods. Substituting it for the foreign market renders possible diversified farming and enables cultivators to substitute for one-crop systems of agriculture scientific rotation of crops, which serves to preserve and perpetuate the fertility of the soil. This advantage is believed by protectionists to outweigh the admitted losses incidental to the protectionist policy and to insure in the long run a greater degree of prosperity than will result from the free play of economic forces.

The infant-industry argument is the one to which economists generally have conceded greatest weight. It is urged in both a special and a general form. As it applies to special industries it rests on a recognition of the risks and difficulties which attend the domestication of new branches of production. In the successful prosecution of any industry three factors coöperate—the requisite natural resources, skilled and unskilled workmen of different grades, and the appropriate forms of capital. As regards each one of these the country which has practiced an industry has a marked advantage over the country which has not. The natural resources of the latter may be superior, but they are undeveloped; its labor force may be ample and adaptable, but it is untrained; its people may be competent to use tools and machines, but they have no familiarity with the special forms of capital needed. Under such circumstances the encouragement of a protective tariff may suffice to induce investors to establish the new industry when without it they would not venture on such a step. After a few years, if the industry to be domesticated has been wisely chosen, the initial difficulties will have been surmounted and the protective duty may be withdrawn without danger of crushing out the now vigorous infant. Advocates of such a policy recognize quite clearly that resort to protection entails a serious burden on consumers. They justify the temporary loss on the ground that the establishment of the new industry on a permanent footing affords in the end a more than compensating gain.

The infant-industry argument in its general form recognizes that countries must usually pass through different stages of industrial development, and advocates protection as a means of accelerating progress during the periods of transition from one stage to another. The best statement of this argument is that given by Friedrich List in his *Das nationale System der politischen Oekonomie* (1841). The conclusions at which List arrived were based on the contrast between an industrial country like England and an agricultural country such as Germany was at the time he wrote. In his opinion England's success as a manufacturing country was due chiefly to the development of certain industrial qualities among her people. Germany, he thought, might develop the same qualities among Germans by means of a protective policy which would force them to manufacture for themselves. Through protection the natural resources of the country necessary to the development of manufacturing would also be opened up to exploitation. From this point of view protection is a temporary means by which an agricultural country may transform itself into an industrial country. After the transformation is completed the new manufacturing industries, or at least a great many of them, will be quite capable of holding their own in competition with the manufacturing industries of other countries and protection will no longer be required.

The last stage in the development of protection in the United States was closely connected with the Civil War. The outbreak of that struggle caused the withdrawal from Congress of the Representatives of the Southern States, who had been the most active opponents of the protective policy. Under the guidance of Representatives from the North and West successive tariffs were passed carrying the policy of protection to the most extreme lengths which the country had known. Factors in this development were the antiforeign sentiment which resulted from the somewhat hostile attitude of Europe and especially of England to the cause of the North, and the comprehensive system of internal revenue taxation adopted during the war, which had to be offset by higher import duties if American producers were not to be placed at a disadvantage in competition with foreign producers. The change in the level of duties which resulted from this combination of circumstances is indicated by the fact that whereas under the Act of 1857 the highest duties imposed were 24 per cent ad valorem, under the Act of 1864 the average rate on dutiable articles was over 47 per cent. Down to 1894 all the important changes made in the tariff were in the direction of increased protection. The Wilson Act of the latter year was a reactionary measure, but was so garbled in its passage through Congress that the tariff-reform President of the period, Mr. Cleveland, allowed it to become a law without his signature. The victory of the Republicans in 1896, although not connected with the tariff issue, involved as an incident a return to a highly protective policy. In fact the Dingley Act of 1897 marks the extreme limit of protectionist policy in the United States.

During this last period only one new argument of importance has been advanced in support of protection, the wages argument. Before protection was the settled policy of the country one of the reasons urged in its favor was that since wages were higher in the United States, some special encouragement was necessary to the establishment there of new industries in competition with the low-wage labor of Europe. After protection became a settled fact, by an interesting inversion the high wages of American labor began to be attributed to it. The wages argument runs as follows: In protected industries higher wages are paid in the United States than in similar industries abroad. Protection, it is concluded, causes the high wages, and its withdrawal would pauperize American labor. This view overlooks several important facts. First, equally high wages are paid in unprotected industries, and these industries, which include farming, mining, transportation, and many branches of manufacturing, vastly exceed in importance and magnitude the protected industries. Second, employers, whether protected or unprotected, desire to secure their labor as cheaply as they can, and there is nothing in a protective tariff which forces them to pay higher wages than are current in the community in which the protected industries are situated. In other words, employers in protected industries pay the wages necessary to get the labor they require, and these depend not upon the protective tariff but upon general industrial conditions. Third, it is not true that high wages and protection always go together. For example, wages in protectionist Germany are distinctly lower than in free-trade England. For these reasons the wages argument, although effective for campaign purposes, has never enjoyed much repute among trained economists. It is, however, urged in a more subtle way by some writers, and in this form merits consideration.

It is argued that the wealth produced in any country is divided into wages, profits, and rent, and that the amount of the last share depends upon the poorness of the marginal land and other natural resources to which resort is made. Protection, as applied in the United States, diverts labor and capital from farming and extractive industries to manufacturing. In consequence, it is claimed, the margin of cultivation to which resort is made is somewhat higher under a protectionist than it would be under a free-trade policy and rents are lower, while wages and profits together are proportionately higher. Hence, it is concluded, protection raises wages at the expense of rent and "other monopoly incomes." In answer to this argument it need only be pointed out that the reasoning, if valid, proves merely that protection secures for labor a larger *relative* share of the total product. If, in so doing, it diverts labor and capital from investments in which they would afford larger returns, as advocates of free trade maintain, it may very well be that labor's larger share of the *smaller* product obtained under the régime of protection is actually less than would be labor's smaller share of the *larger* product that would be secured under the régime of free trade.

Present-day advocates of protection in the United States may be divided into two classes—those who defend it as a temporary and those who defend it as a permanent policy. Among the former it is beginning to be actively discussed whether protection has not done its greatest possible service for the country and whether a gradual transition to a free-trade policy would not be desirable. Writers answering these questions in the affirmative advocate the abolition of the protective duties on raw materials, trust-made manufactures, etc., and emphasize the importance of allowing foreign goods to enter the country more freely in order that American industries capable of developing an export trade may find larger foreign markets for their products. Advocates of protection as a permanent policy urge it not only on economic grounds, but as a means of fostering the sentiment of nationality and of perpetuating those characteristics which distinguish the United States from other countries. Free trade is characterized by them as a cosmopolitan policy which appeals to the foreign-hearted, while protection is extolled as the national system to the support of which all true lovers of country must rally. Strong as is the appeal which these "higher considerations" make to the patriotic citizen, there is a certain vagueness about their application to tariff problems which makes the shaping of a law by reference to them difficult. Appeals to patriotism in connection with protection are significant chiefly because they introduce a moral earnestness into discussions which would otherwise be narrowly commercial.

Since Great Britain adopted a free-trade policy in 1846, the leading protectionist country of the world, next to the United States, has been Germany. There also the application of protection was coincident with a remarkable development of manufacturing industries, which seemed to justify fully the expectations of advocates of the policy. Germany's success in domesticating manufacturing industries led France, Austria-Hungary, and later Russia to emulate her example. Europe was thus engaged in a war of hostile tariffs, in which each important country was trying to build up its own industries by discouraging importations from its neighbors. In Great Britain an Imperial federation to include all the dependencies of the country in a commercial alliance against the rest of the world is beginning to be advocated. Finally, the policy of expansion upon which the United States seems to be embarked must have as one of its incidents the admission of new areas within the American tariff wall. As protectionist areas grow the difficulty of harmonizing divergent interests by means of protective tariffs is bound to increase, and this affords perhaps the surest ground for a belief in the eventual triumph of free trade.

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PROTECTION, New England Order of. A secret beneficiary society paying life insurance. It was formed at Philadelphia in 1887, by men and women members of Knights and Ladies of Honor who broke from the latter over a question of separate jurisdiction for New England. Its headquarters are at Boston and membership is restricted to residents of New England. There is a supreme lodge and six grand lodges. Total membership is 54,672, and aggregate disbursements for insurance and relief since 1887 amount to about $12,819,280.

PROTECTIVE ASSOCIATION, American. A secret organization, commonly known as the A. P. A., which was formed in the United States to combat the influence of Roman Catholicism. Its platform, as published by a supreme council held at Des Moines, Iowa, in May, 1894, stated that "subjection to and support of any ecclesiastical power not created and controlled by American citizens and which claims equal, if not greater, sovereignty than the government of the United States of America, is irreconcilable with American citizenship," that State assistance to parochial schools and Church interference with public education are undesirable, and that restrictions ought to be imposed on immigration. Candidates for admission into the order were required to take oath never to favor or aid the choice of a Roman Catholic to political office, and never to employ a Roman Catholic in any capacity if the services of a Protestant could be obtained. The order was first established at Clinton, Iowa, in 1887 by a lawyer, Henry F. Bowers. It obtained its greatest foothold in the Middle West, but it extended even to Canada, England, and Australia, and an international organization was ultimately effected. In 1896 its president, W. J. H. Traynor, claimed for it a membership of almost 2,500,000. The order soon began to interfere in politics, and forced many candidates for office to promise to act in accordance with its principles. In 1896 its president claimed that almost one hundred of the National Representatives and many of the Senators chosen in 1894 had given such pledges, although many had broken them. For a time it seemed that the order would probably run a similar course to the American Party, or Know-Nothings (q.v.), with which it was often compared. Soon, however, the denunciations of clear-sighted, influential men, and the realization that the dangers dreaded were almost if not altogether imaginary, had their effect, and the decline of the order after 1900 was even more rapid than its rise, although the national organization was maintained. Affiliated with the A. P. A. were the Junior United Order of American Mechanics, the Patriotic Order of the Sons of America, and other organizations. Consult: *Congressional Record* (Washington, Oct. 31, 1893); H. J. Desmond, *The A. P. A. Movement* (ib., 1910); also Traynor in *North American Review*, vol. clix (New York, 1887).

PROTECTIVE COLORATION AND RESEMBLANCE. All organisms are beautifully adapted to the world around them, and this adaptation in a large proportion of animals extends to their colors. Owing to this adaptive coloration, certain insects, frogs, reptiles, birds, and mammals are protected from the observation of their natural enemies.

In marine fishes the ground coloration is, according to Jordan, protective in its nature. The fish, especially if swimming near the bottom, is better protected if the olivaceous surface is marked by darker cross sheaths and blotches. These give the fish, he says, a closer resemblance to the weeds about it, or to the sand or rocks on which it lies. As a rule no fish which lies on the bottom is ever uniformly colored. At a depth of from 50 to 150 fathoms in the tropics a large proportion are red of various shades. Several of the large groupers of the West Indies are represented by two color forms; the shore form is olive green, and the deeper water form is crimson. Deep-sea pikes are black or violet black, with no markings. Desert animals are usually gray or tawny or sandy; forest animals are frequently green, marine animals olive or reddish, pelagic animals transparent, while the typical Arctic mammals and birds are white. The polar bear, hare, snowy owl, and Greenland falcon are white throughout the year, while the fox, lemming, American hare, ermine, stoat, and ptarmigan change their summer dress of dull hues to white.

There has recently been a great deal of discussion in regard to protective coloration. The supporters of one extreme see protection in almost all colors and patterns, while their opponents hold that even the dullest colored are conspicuous in their native haunts. The truth seems to lie between the two points of view. The crucial factor is that of movement. The brownest sparrow among dead leaves is conspicuous when hopping, while the most brilliant tanager among sunlit foliage is difficult to detect as long as it remains motionless.

Color Preference. Different aquatic animals exhibit a marked preference for certain colors of the spectrum in which they feel better. The little fresh-water crustacean *Daphnia* prefers to swim in orange, yellow, and especially green rays. The starfish shuns the red rays. Animals which love the light, as bees, prefer blue or green rays, while the light-shunning or lucifugous insects, such as ants, have less antipathy for red than for other colors. In such cases it has been thought by Cuénot that light doubtless acts as an excitant on respiration. As has been repeatedly noticed, the common house fly prefers green to lavender, and black to white. On the other hand, locusts are attracted and will alight upon white or light-colored clothes, and not be attracted by dark. The preference of flies for dark cloth may be due to the fact that it absorbs more heat than white cloth, and thus favors quicker respiration and greater activity, especially in the coolness of the autumn.

Protection Due to Conspicuous Bars, Stripes, and Spots. Although the giraffe, the zebra, and the jaguar seem most conspicuously colored, we are assured that the spots upon the jaguar, e.g., harmonize with the oval patches of sunlight. Sir Samuel Baker says that the striped skin of the tiger harmonizes with dry sticks, yellowish tufts of grass, and the remains of burnt stumps of its habitat, and even the giraffe is far from conspicuous when found in its native forests. The African antelopes are strikingly marked on the body and head as well as the feet with white stripes and patches in general like those of zebras, which Pocock regards as "representing spots or streaks of sunlight passing through foliage or reflected from leaves," and that these marks are for protection rather than for recognition. He thinks that such markings come within the scope of Thayer's hypothesis of concealment by the counteraction of light and shade. Of the species of elands of Africa one lives in the forest and is reddish and conspicuously striped with white, the neck being black; on the other hand, the common eland is dun-colored with no sign of stripes and lives in deserts. So it is with the koodoos; the lesser one living in thick jungles is much more strikingly marked than the larger species which lives in hilly mountainous regions or on the open plains.

Mimicry. Many butterflies of the group Heliconidæ are associated with species of *Leptalis* belonging to another family (Pieridæ) which copy the heliconid butterflies in form and color, and which, probably owing to a bad odor secreted by glands in the end of the body, are distasteful to birds. It is supposed by Bates, Wallace, Darwin, and others that were not the mimics disguised as heliconias they would be devoured by birds and thus become extinct. These authors believe that the resemblance has been brought about by natural selection. In his "Contributions to an Insect Fauna of the Amazon Valley," Henry Walter Bates (q.v.) calls attention to the fact that a large number of the species of Heliconidæ "are accompanied in the districts they inhabit by other species which counterfeit them." According to Fritz Müller (although Bates states the same idea), the species serving as the model, being unpalatable to birds on account of its repulsive taste and odor, is therefore safe from its foes, while the mimic, which has no bad taste or odor, is protected from attack. Mr. Bates's own views are moderate compared with those of Wallace and later extreme advocates of Darwinian mimicry. In his original essay Bates shows that the majority of the species of Heliconidæ have very limited ranges, and contends that the cause of the formation of the local varieties is "the direct action of physical conditions on the individuals." Several entomologists, Elwes, Packard, and others, have not accepted the hypothesis of Bates and Müller that the mimicry is due to natural selection, but hold that the mimicry is accidental and due to convergence, or to similarities in the environment. The markings, such as similar hues in models and mimics, bars and spots, Packard believes are due to such effects of light and shade, moisture and temperature, as have produced them in birds, mammals, and reptiles. They may be perpetuated and preserved by natural selection, but the primary cause of this originally is the action of the physical agents mentioned, or at least environmental causes affecting both models and mimics. Much stress is laid on the attacks of birds in bringing about or aiding the process of natural selection of these markings. It is, however, to be observed that neither Bates, Müller, nor Wallace, all of whom lived for many years in the tropics, has ever seen a bird chase and devour butterflies. In fact, only a few insectivorous birds catch butterflies or care to chase them. After several years' special research on the habits of sparrows and other insectivorous birds, Judd states in a report to the United States Department of Agriculture that he does not know of any kind of bird "that feeds upon butterflies during any month of the year to the extent of one-tenth of one per cent of its food."

It thus appears from a comprehensive survey of the markings of animals of different classes, living both in the sea and on land, that the causes of the similarity in their markings are due to the effects of light and shade, also perhaps to moisture—at all events to the action of the surroundings. It should also be borne in mind that the range of primary colors is not very great, nor of stripes and bars; under similar physical conditions the color and spots and stripes and their location on the body are repeated in animals of different groups and species. Nature is limited in the disposal of ornamental features. Hence models and mimics may be protectively ornamented with the same hues and patterns, and it is probable that selection and the attacks of birds and lizards have had little to do with the origination of protective coloration.

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PROTEC'TOR. An English title equivalent to that of regent, denoting a nonregal head of the government under exceptional circumstances, as during a minority or an interregnum. The title was given to Humphrey, Duke of Gloucester, during the minority of Henry VI from 1422 until the crowning of the young King in 1430. Richard, Duke of York, father of Edward IV and Richard III, acted as Protector of the Kingdom at different times during the later years of Henry VI's reign. His son, Richard, Duke of Gloucester, was Protector for about two months in 1483, prior to his accession in the same year as Richard III. The Duke of Somerset, at the head of a council during the minority of Edward VI, bore the title from 1547 to 1549, until he was deposed by his colleagues. In 1653 Cromwell was installed as Lord Protector of the Commonwealth of England, Scotland, and Ireland under the provisions of the Instrument of Government (q.v.), and in 1657 was reinstalled under the provisions of the Humble Petition and Advice. On his death, in 1658, his oldest son, Richard, succeeded to the title and authority, but resigned the office in the following year.

PROTEC′TORATE. A relation assumed by a stronger nation towards a weaker one whereby the former protects the latter from hostile invasion or dictation and interferes more or less in its internal affairs. This relation is established by treaty between the protecting and the protected State, or among a number of States in respect to another State, by which the extent and character of the protectorate are determined. Usually the foreign relations of the protected State, including the right to wage war, are controlled by the protecting State.

PROTEIDS, prō′tē̂-ĭdz. See PROTEINS. ✓

PROTEINS, prō′tē̂-ĭnz (from Gk. πρῶτος, *prōtos*, first). A name applied to an exceedingly important group or class of highly complex chemical substances, widely distributed in nature. Like carbohydrates and fats, they contain carbon, hydrogen, and oxygen, but differ from these inasmuch as they invariably contain nitrogen in addition and in most instances also contain sulphur. In some proteins, phosphorus, iodine, and other elements may be present.

The percentage (or elementary) composition of the proteins varies with their source but only within very narrow limits. The following analyses will serve as an example:

Carbon	50–54 per cent
Hydrogen	6.5–7.3 per cent
Oxygen	21.5–23.5 per cent
Sulphur	0.3–5 per cent
Nitrogen	15–17.6 per cent

Proteins, when burned, leave behind a small amount of mineral matter or ash, but owing to the extreme difficulty of removing mineral substances from these bodies, investigators in this field are unprepared to say whether they enter into the makeup of the protein molecule or not. The protein molecule is of an enormous size and an idea can be gained of this by taking as an example the protein of the white of egg, $C_{239}H_{386}N_{58}S_2O_{78}$.

General Characteristics. Many proteins are soluble in water or saline solutions, and are rendered insoluble or are coagulated when heated. The temperature required for coagulation differs with different proteins. With few exceptions proteins are colloids and pass with difficulty through animal membranes. They are levorotatory, and nonconductors of electricity.

With strong nitric acid, the proteins when heated to boiling give yellow flakes or a yellow solution, this being known as the xanthoproteic reaction. When a protein in the solid state or in solution is boiled with a solution of mercuric nitrate in nitric acid containing some nitrous acid (Millon's reagent), a red coloration is produced.

Proteins are precipitated by a great many reagents, the peptones and albumoses being excepted in a number of cases. Thus solutions of proteins are precipitated (1) by strong acids, (2) by picric acid, (3) by acetic acid and potassium ferrocyanide, (4) by acetic acid and excess of neutral salts, (5) by salts of heavy metals, (6) by tannin, (7) by alcohol, and (8) by saturation with some neutral salts, but in the light of the newer researches, proteins have come to be regarded as structures made up of a number of amino acids (substances having both basic and acidic properties, i.e., amphoteric, by virtue of the fact that their molecules contain COOH and NH_2 groups), both monamino and diamino forms. Among the amino acids derived from proteins are glycine (glycocoll), alanine, leucine, isoleucine, phenylalanine, tyrosine, serine, cystine, aspartic acid, glutamic acid, lysine, ornithine, arginine, proline, histidine, oxyproline, tryptophane, trihydroxydodecanoic acid and glucosamine (?).

Liebig was the first one to regard proteins as combinations of amino acids. Hofmeister added to this knowledge by saying that the acid amid form of combination of amino acids is the principal form in the protein molecule. The view of Hofmeister is supported by the researches of Fischer and others, and resulted in the preparation by Fischer and others of combinations of amino acid termed polypeptids. These synthetic polypeptids have properties similar to those of peptones derived from proteins by hydrolysis with dilute acids, alkalies, or with pepsin.

A large number—more than 200 in all—of di-, tri-, tetra-, penta-, etc., peptids have been prepared. When polypeptids contain three units they give the biuret reaction and some other reactions characteristic of proteins. The higher polypeptids, e.g., are precipitated by phosphotungstic and tannic acids and some are also precipitated by ammonium sulphate. The octa- and deca- peptids possess the highest molecular weight of all compounds obtained by synthesis. If these compounds were discovered in nature they would undoubtedly be regarded as proteins. Polypeptids also resemble proteins in their behavior with enzymes. Trypsin, e.g., will hydrolyze some of the peptids. The peptids are not attacked by pepsin.

No absolutely satisfactory classification of proteins is known, the best being that proposed by a joint committee of the American Physiological Society and the American Society of Biological Chemists.

The earliest known vegetable protein was wheat gluten. This was isolated by Beccari in the eighteenth century. About the same time Braconet isolated a protein from peas and beans which is now known as legumin. Gay-Lussac was the first to point out the occurrence of proteins in seeds. Liebig and his pupils, however, must be regarded as the pioneers who led to our present conceptions of protein chemistry. Liebig distinguished between plant albumin, plant casein, and plant fibrin on the basis that the former was coagulated by heat and the second not coagulated by heat. Neither plant fibrin nor plant casein is precipitated by acids. It is principally due to two American workers, viz., Chittenden and Osborne, that the full value of the methods of fractional salt precipitation for vegetable protein chemistry was established.

The best-known vegetable proteins are zein from maize, hordein from barley, gliadin, glutenin, and leucosin from wheat, edestin from hemp, and excelsin from the Para nut. Up to the present time about 23 seed proteins have been systematically studied. All of them on hydrolysis yield leucine, proline, phenylalanine, asparagine, glutamic acid, tyrosine, histidine, arginine, and ammonia. Two showed no glycine (glycocoll), two no alanine, four no lysine, and one no tryptophane. Zein, the protein of Indian corn, yielded neither glycine, lysine, nor tryptophane. Three gave no cystine and two others only gave evidences of traces of this amino acid. These findings have an important bearing on nutrition of animals. We are still ignorant of the state in which proteins are present in the cell and cell juice, and our knowledge of the nature of proteins present in the mature plant is limited when compared with what we know of these complexes in seeds.

Physically speaking, almost all of the vegetable proteins are present in plants in a colloidal state, and evidences of proteins in crystalline form have been found in the aleurone grains of oil-bearing seeds, as the Para nut, castor-oil seed, etc.

It should not be said, however, that some vegetable proteins soluble in alcohol lose their property of being coagulated by heat and give evidence of a diminished viscosity. This is probably distinct evidence that numerous transition stages exist between the colloidal and crystalloidal conditions.

Animal Proteins. In the animal kingdom albumins are found in milk, white of egg, and blood serum; globulin in blood serum and egg white; albuminoids (or scleroproteins) in skeletal structures and appendages—represented by collagen, gelatin? (a transformation product of collagen); keratin (from horn), elastin (from ligaments), and spongin; phosphoproteins in vitellin of egg yolk; casein (caseinogen) in milk; protamins in roe of fishes, e.g., salmine, sturine, etc.; histones in blood (globin) and thymus. (thymus histone); glycoproteins (mucins, chondroproteins and mucoids, etc.) in the salivary glands, bile bronchi and in cartilages; hemoglobin in the red blood, hemocyanin in blue blood of molluscs and crustaceans; lecithoproteins, e.g., lecithans, phosphatids, in the nervous tissues, body fluids, etc.; and nucleoproteins in the nuclei of cells, i.e., blood cells, spermatozoa, thymus, pancreas, liver, etc. Vegetable proteins have many characteristics in common with animal proteins. Thus vegetable like animal globulins are insoluble in water, but soluble in salt solution, and are precipitated on dilution or removal of the salt by dialysis. Like the vegetable proteins, animal proteins are present in the animal organism in a colloidal state. Crystalline proteins are not so frequently found in the animal as in the vegetable kingdom. The coagulating temperature of edestin, the protein of hemp seed, is 90° C. (194° F.), which is much higher than has been found for any animal globulin. Vegetable proteins on hydrolysis yield more glutamic acid than do animal proteins and many yield more proline, arginine, and ammonia. Furthermore alcohol soluble proteins, viz., the protamines, are found only in the vegetable kingdom. Briefly it may be said that the greatest difference is found in the groups of albumins and globulins.

Protein has come to be regarded as one of the most, if not the most, necessary constituents of food for man and animals. On the one hand it serves as a builder of tissue and a replenisher of wasted tissue, and on the other it serves as a source of energy. Its function as a builder cannot be performed by any other food constituent.

Protein when taken into the body, whether this be in the shape of white of egg, meat, or in peas or beans, is acted upon principally by the pepsin ferment in the stomach. Our ideas regarding the nature of the products formed in the course of peptic proteolysis have been considerably modified during the past few years. The former view that the products obtained included only acid albuminates (and meta proteins), proteoses, and peptones is no longer tenable. As the result of numerous observations it has been learned that artificial gastric digestion if allowed to go on for a sufficient length of time will ultimately yield in addition to proteoses a large number of cleavage products crystalline in structure which include aspartic acid, glutamic acid, tyrosine, phenylalanine, proline, leucine, valine, and lysine. A similar group of substances is formed if proteins are subjected to the action of trypsin, the principal proteolytic ferment of the pancreatic juice. Peptic digestion differs from tryptic digestion only in so far that more amino acids are formed in the latter. The products of protein digestion are taken up by the villi, and there again in the walls of the intestine some of them undergo changes which are of the opposite kind. In this locality the proteoses, peptones, and amino acids probably recombine into albumins, globulins, etc. It must be said, however, that amino acids have been found in the circulating blood. The recombined proteins which serve to replenish tissue, or build new tissue, are fixed at the necessary locus while the excess is katabolized and its products either discharged from the body or its molecule is rearranged and deamidized, and serves as a source of fat and possibly carbohydrates.

The amount of protein taken by the individual each day must be adequate to keep the body in what is termed the nitrogen equilibrium. Voit says 118 grams of protein is necessary per day for a 150-pound man, Rubner sets the standard as 127 grams, Atwater 125 grams, while Chittenden claims 60 grams is the proper amount. Various conditions of living undoubtedly influence the amount of food required.

Recent work has shown that protein intended for maintenance must be of the right kind. While some proteins, as gelatin, when fed will tend to lower the waste of body protein they cannot by themselves wholly repair it. This is due to the fact that it lacks some of the amino acids essential for the elaboration of body protein. Experiments made on mice by Osborne and Mendel showed when zein—the protein of maize—was the only source of protein the animals under experiment died. If, however, the amino acids (lysine and tryptophane) lacking in the zein which are necessary for growth were supplied, growth went on at the normal rate. Glycocoll lacking in the zein is synthesized by the body itself. Protein when broken down in the body of man is in a great measure discharged in the urine as urea. Proteins occur in much greater abundance in animals than in plants. Plants unlike animals cannot make use of highly complex bodies as protein and their cleavage products as food. The material necessary for the synthesis of protein is chiefly obtained from the nitrogen of the atmosphere, ammonia salts, nitrates and nitrites in the soil. In other words, plants are able to manufacture organic body tissue from inorganic substances.

It has long been known that when protein substances undergo putrefaction a number of more or less poisonous products of a basic character are found. To some of these products the name ptomaines (q.v.) has been given. As a rule these bases are closely related to the simple amino and imino compounds into which proteins are resolved by hydrolysis. The formation of simple physiologically active bases from proteins must not be regarded as being due to the agency of bacteria alone, for there is reason to believe that they are also formed by the natural processes in the tissues of animals and plants. The base B-iminazolylethyl amine, e.g., when injected into an animal produces symptoms or manifestations which are similar to those shown by another animal which has been rendered anaphylactic by repeated doses of protein.

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PROTELES, prŏt′ĕ-lēz. See Aard-Wolf.

PRO′TERAN′DRY. See Pollination.

PRO′TEROG′LYPHA (Neo-Lat. nom. pl., from Gk. πρότερος, *proteros*, fore, comp. of πρό, *pro*, before + γλύφειν, *glyphein*, to carve). A section of the great group of colubrine serpents, including those in which the anterior maxillary teeth are so deeply grooved as to appear tubular and which form enlarged fangs for the conveyance of poison into the wound made by their bite. (Cf. Opisthoglypha.) All are extremely poisonous, most are viviparous, and they are distributed throughout all the warmer parts of the world except Madagascar and New Zealand.

PRO′TEROG′YNY. See Pollination.

PROTEROZO′IC ERA (from Gk. πρότερος, *proteros*, fore + ζωή, *zōē*, life). In geology the period of time that followed the Archeozoic era and preceded the Paleozoic era. The records of this time interval are found in a great assemblage of strata which consist mainly of sediments more or less thoroughly metamorphosed. Fossil remains are seldom to be found, though they do occur in a few localities, but it is well established that life was abundant over the earth and of quite varied character. See Geology.

PRO′TESILA′US (Lat., from Gk. Πρωτεσίλαος, *Prōtesilaos*). A legendary king of Phylace, in Thessaly, son of Iphiclus and brother of Podarces. He married Laodamia, and soon after sailed with the other Greeks to the Trojan War. According to the story he was the first Greek to spring on shore, and also the first to fall by the hand of Hector. His young wife, Laodamia, overwhelmed with grief at the news, besought the gods that he might return, if for only three hours. Her prayer was granted; Hermes led Protesilaus back to earth, and when the allotted time had passed Laodamia slew herself that she might not again be separated from her husband. According to another version, which seems to have been followed by Euripides in a lost tragedy, Laodamia made an image of her husband and lavished affection on it. Her father, Acastus, sought to take it from her. Protesilaus, probably at his own prayer, returned for a brief space from the lower world, and Laodamia, as in the other story, accompanied him on his return. There were a tomb and a sacred precinct of Protesilaus at Elaios on the extremity of the Thracian Chersonese, and apparently an oracle connected with it. In Thessaly also a festival called the Protesilaia was celebrated with athletic contests.

PRO′TEST (from Lat. *protestari*, *protestare*, to declare publicly, bear witness, from *pro*, before, for + *testari*, to bear witness, from *testis*, witness), Certificate of. A formal document by a notary public or other duly authorized person, attesting the truth of some statement of fact therein contained. It is often employed in shipping transactions in the form of a complaint by or on behalf of the master of a vessel as to accidents, or injury, or breaches of duty committed by charterers or consignees, causing delay or damage to the ship; or of a complaint by the shipper against the master for misconduct, or delay or refusal to sign customary bills of lading. It is most frequently employed, however, in connection with negotiable paper, for the purpose of affording evidence that the paper therein described has not been duly honored. The law merchant, as it has been understood in England and in this country, requires a protest only in case of a foreign bill of exchange. By modern statutes, however, the formality is authorized and the fees and expenses thereof are collectible in the case of an inland bill, check, or promissory note. The protest is to be made by a notary public under his hand and official seal, or by a reputable resident of the place where the instrument is dishonored, in the presence of two or more creditable witnesses. On the day of dishonor the notary should make a memorandum of the fact that the paper has been duly presented and dishonored. This is termed noting the dishonor. At his convenience thereafter he may extend the protest, i.e., draw up, sign, and seal the formal certificate. This document must specify: (1) the time and place of presentment; (2) the fact that presentment was made and the manner thereof; (3) the cause or reason for protesting the bill; (4) the demand made and the answer given, if any, or the fact that the drawer, or accepter, or maker could not be found.

The term "protest" is often used to designate all the proceedings which are necessary to fix the liability of a drawer or indorser, including the notice of dishonor. As a technical term of the law, however, it is limited to its original signification of a formal document prepared to bear witness to (*protestari*) the fact of dishonor. Consult Brooke, *Treatise on the Office and Practice of a Notary of England* (6th ed., London, 1901), and J. W. Daniel, *A Treatise on the Law of Negotiable Instruments* (5th ed., 2 vols., New York, 1903). See BILL OF EXCHANGE; DISHONOR; NEGOTIABLE INSTRUMENTS.

PROT′ESTANT EPISCOPAL CHURCH. See EPISCOPAL CHURCH.

PROT′ESTANTISM. A term which has become a general designation for the system adopted by the reformers in the sixteenth century and followed by their successors in later times. The name Protestant was first applied to the adherents of Luther, from their protesting against the decree passed by the Catholic states at the second Diet of Speyer in 1529. This decree had forbidden any further innovations in religion and enjoined those states that had adopted the new principles so far to retrace their steps as to reintroduce the mass, order their ministers to avoid disputed questions, and use and explain the Scriptures only as they had hitherto been used and explained in the Church. The essential principles involved in the protest and in the arguments on which it was grounded were: (1) that the Roman Catholic church cannot be the judge of the reformed churches, which are no longer in communion with her; (2) that the authority of the Bible is supreme and above that of councils and bishops; (3) that the Bible is not to be interpreted and used according to tradition or use and wont, but to be explained by means of itself—its own language and connection. As this doctrine, that the Bible, explained independently of all external tradition, is the sole authority in all matters of faith and discipline, is really the foundation stone of the Reformation, the term Protestant was extended from those who signed the Speyer protest to all who embraced the fundamental principle involved in it. The essence of Protestantism, therefore, does not consist in holding any special system of doctrines and discipline, but in holding the Bible to be the source of religious authority and maintaining the right of private judgment as to its meaning; and thus a church might, in time, see reason to depart from special points of its hitherto received creed without thereby ceasing to be Protestant. The symbols or confessions of the Protestant churches were not intended as rules of faith for all time, but as expressions of what was then believed to be the sense of Scripture. This implies a theory of the Church. Protestantism holds that the Church is a community of believers, in which the sacraments are administered and the gospel preached, and denies that its validity depends upon its being in organized connection with the churches of other lands or, some Protestants would say, with any other churches at all. In the period after the Reformation the continental churches preferred the terms Evangelical, Lutheran, and Reformed, but the convenience of Protestant as a name uniting all the non-Catholic branches is so great that it has come into common use. The problem of its use in the Church of England (q.v.) has been more difficult. This church went through the Reformation without a break from its former organization, but with sympathy and even formal fellowship with the Lutheran and Calvinistic reformers of the Continent. The modern High Church party, emphasizing the continuity and catholicity of the Church, have repudiated the name Protestant. The Evangelical and Low Church party, emphasizing the anti-Roman elements in the church, have used the term freely, and publicly gloried in their Protestantism. The same difference of opinion has risen in the Episcopal church in America, complicated by the fact that the official name is the Protestant Episcopal Church of America (q.v.). Many have wished to drop the word Protestant as representing a local and sectarian idea. Whether appropriate in the name of a church or not, it has a historic use as the name of a particular form of the Christian religion.

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PRO′TEUS (Lat., from Gk. Πρώτευς). In the Homeric poems (*Odyssey*, iv, 357 ff.), a prophetic old man of the sea (*ἅλιος γέρων*, *halios gerōn*) who tends the seal flocks of Poseidon (Neptune) and has the gift of endless transformation. His favorite residence was the island of Pharos, off the mouth of the Nile, according to Vergil (*Georgics*, iv, 387 ff.) the island of Carpathos (now Skarpanto), between Crete and Rhodes. Here he rose at midday from the floods and slept in the shadow of the rocky shores, surrounded by the monsters of the deep. Here he must be sought and captured by surprise, for he prophesied most unwillingly and sought to escape by his power of transformation. If, however, his captor held him firmly in every shape, he resumed his original form and revealed the future unerringly. In Herodotus Proteus has become a king of Egypt, who received Paris and Helena and retained the latter, while Paris took only a phantom with him to Troy. On the arrival of Menelaus in Egypt after the fall of Troy, Proteus restored to him his wife.

PROTEUS. A slender pennibranchiate salamander (*Proteus anguinus*), called olin by the Germans, which is closely related to the North American mud puppy (q.v.) and is found in subterranean waters in the absolutely dark limestone caverns of Carniola, Carinthia, and Dalmatia. Almost nothing is known of its habits. It is 10 or 12 inches long, seldom above ½ inch in thickness, and pinkish white with the gills carmine red. Specimens have been kept alive in confinement for several years, in a darkened aquarium, apparently without food. It lays eggs and fastens them singly to stones under water, and the larvæ nearly resemble the adults. Consult Hans Gadow, "Amphibia and Reptiles," in *Cambridge Natural History*, vol. viii (London, 1901), and G. A. Boulenger, *Reptiles and Amphibians* (New York, 1914).

PRO′TEVANGE′LIUM OF JAMES. See APOCRYPHA.

PRO′THALA′MION (Neo-Lat., from Gk. *πρό*, *pro*, before + *θαλάμιος*, *thalamios*, nuptial). A poem by Edmund Spenser (1596), written for the double marriage of Elizabeth and Catherine Somerset, daughters of the Earl of Worcester.

PRO′THAL′LIUM, PROTHALLUS (Neo-Lat., from Lat. *pro*, before + *thallus*, from Gk. θαλλός, young twig). The sexual generation (gametophyte) of ferns; often extended to include the gametophytes of seed plants. See PTERIDOPHYTES.

PROTHERO, prŏth′ẽr-ō, GEORGE WALTER (1848–). An English historian and biographer, born in Wiltshire and educated at Eton, at King's College, Cambridge, and at the University of Bonn. After holding several appointments at Cambridge he served as professor of history at Edinburgh from 1894 to 1899, and thereafter as editor of the *Quarterly Review*, succeeding his brother. (See PROTHERO, ROWLAND EDMUND.) From 1901 to 1905 he was president of the Royal Historical Society. Prothero came to America in 1910 to be Schouler lecturer at Johns Hopkins and Lowell lecturer in Boston. He received honorary degrees from Cambridge, Edinburgh, and Harvard. His work includes: *The Life and Times of Simon de Montfort* (1877); *Memoir of Henry Bradshaw* (1889); an edition of *Select Statutes* from the reigns of Elizabeth and James I (1894); and an edition of *The Growth of British Policy* (1895), by J. R. Seeley, whose life he wrote for the *Dictionary of National Biography.* He was editor of the *Cambridge Historical Series* and coeditor of the *Cambridge Modern History.*

PROTHERO, ROWLAND EDMUND (1852–). An English writer, brother of G. W. Prothero. He was born at Clifton-on-Teme, Hampshire, and was educated at Marlborough School and at Balliol College, Oxford, where he graduated with honors in classics and modern history. From 1875 to 1891 he was fellow of All Souls, Oxford; from 1894 to 1899 he edited the *Quarterly Review;* and in 1914 he was chosen (Conservative) member of Parliament for the University of Oxford. His principal publications are: *Life and Correspondence of Dean Stanley* (1893); *Letters and Verses of Dean Stanley* (1895); *Letters of Edward Gibbon* (1896); *H. R. H. Prince Henry of Battenberg* (1897); *Life of Queen Victoria* (1897); *Letters and Journals of Lord Byron* (1898–1900); *The Psalms in Human Life* (London, 1903; New York, 1915); *The Pleasant Land of France* (1908); *English Farming, Past and Present* (new ed., 1912).

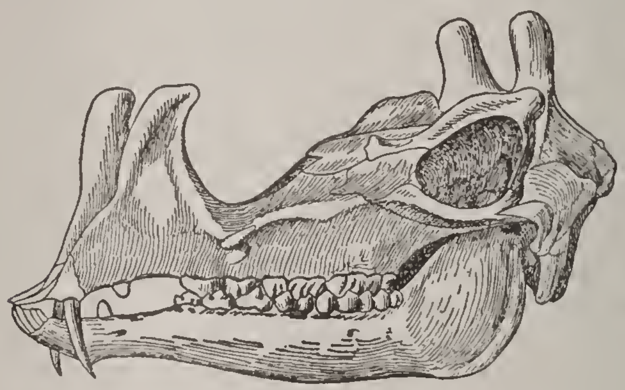
PROTH′ESIS. See ETYMOLOGY, FIGURES OF.

PROTHONOTARY (prō-thŏn′ō-tā-rĭ) **WARBLER** (OF. *prothonotaire*, Fr. *protonotaire*, from ML. *protonotarius*, chief notary, from Gk. πρῶτος, *prōtos*, first + Lat. *notarius*, notary, scribe, from *nota*, mark, from *noscere*, to know; ultimately connected with Eng. *know*). A wood warbler (*Protonotaria citrea*) of the Mississippi valley from southern Illinois southward. It is rich yellow over the head and neck and lower parts and olive green upon the back, wings, and tail, with the lining of the wings and the tail coverts white. It is peculiar principally in nesting in holes in old trees.

PROTIS′TA (Neo-Lat. nom. pl., from Gk. πρώτιστος, very first, superlative of πρῶτος, *prōtos*, first, from πρό, *pro*, before). A group name proposed by Haeckel in 1878 for the lowest Protozoa and Protophyta; it forms a neutral kingdom containing the simplest plants and animals. Haeckel claims that the Protista show in their external form, structure, and vital phenomena such a remarkable mixture of animal and vegetable properties that they cannot justly be assigned to either the vegetable or the animal kingdom.

PROTIUM, prō′shĭ-ŭm (Neo-Lat., perhaps from a Javanese name), formerly called ICICA. A genus of pinnate-leaved trees of the family Burseraceæ, with white flowers in panicled racemes. *Protium icicariba*, a Brazilian species with fragrant resinous seeds, yields American elemi (q.v.); *Protium heptaphyllum* and *Protium guianense*, natives of Guiana, yield fragrant balsams, which harden into a gray resin, used as incense in churches; *Protium altissimum*, another Guiana tree, which attains a height of 100 feet, is used in house carpentry, canoe and furniture making. Its wood is known as white cedar, red cedar, acuyari, Samaria, Mara, and Curana wood.

PROTOC′ERAS (Neo-Lat., from Gk. πρῶτος, *prōtos*, first + κέρας, *keras*, horn). A primitive ungulate found fossil in the White River beds of South Dakota. The animal was somewhat larger than a sheep and had a long narrow skull, armed in the male with two to six pairs of horns and in the female with one pair of small protuberances. The upper incisors are absent, the lower incisors well developed, and the upper canines of the male are much enlarged to form tusks. The ancestry and descendants of this animal are unknown and it constitutes a distinct isolated family remotely related to the modern chevrotains (*Tragulidæ*) of the Indo-Malayan region and west Africa. Consult Scott, "Osteology and Relationships of Protoceras," in *Journal of Morphology*, vol. xi (Chicago, 1895).



PROTOCERAS SKULL.

PROTOCOCCALES, prō′tō-kŏk-ā′lēz. See ALGÆ; CHLOROPHYCEÆ.

PRO′TOCOL (ML. *protocollum*, from MGk. πρωτόκολλον, *prōtokollon*, protocol, first leaf glued to a manuscript, from Gk. πρῶτος, *prōtos*, first + κολλᾶν, *kollan*, to glue, from κόλλα, *kolla*, glue). A term of diplomacy applied to the minutes or preliminary draft of an instrument or agreement between two or more states and intended to serve as the basis of negotiations for the conclusion of a definite treaty. The term is applied also to the formally authenticated minutes of the proceedings of a congress or conference, as where a number of friendly powers enter into a preliminary agreement to accomplish certain diplomatic ends by peaceful means.

PROTOCOL, THE INDUSTRIAL. In general, an instrument for the adjustment by arbitration and conciliation of differences arising between labor organizations and employers. Specifically it is the unique agreement entered into at New York by the International Ladies' Garment Workers' Union and the Manufacturers' Protective Association under which all differences in the cloak, suit, and skirt industry are settled without recourse to strikes or lockouts. It originated in 1910 after the protracted strike in the tailoring industry in the summer of that year, and was largely the work of Louis D. Brandeis, Julius Henry Cohen, and Meyer London (q.v.).

The important features of the industrial protocol are: (1) the provision for collective bargaining unlimited by time; (2) the establishment of a minimum-wage scale and a maximum working week; (3) the provision for a preferential union shop in place of the closed or open shop; and (4) the formation of a board of grievances to act as an industrial court, a board of arbitration to act as a court of appeals, and a joint board of sanitary control to regulate the sanitary conditions of factories. The two first-mentioned boards, on each of which the unions and the manufacturers are equally represented, constitute the machinery for settling industrial disputes.

The method of procedure is, in general, as follows: whenever any difference arises between an employer and his employees, it is first discussed by the former (or his representative) and the shop chairman elected by the latter. If a dispute cannot be so settled it is taken up by specially trained investigators, called clerks, who usually reach an amicable decision. Should they, too, fail, the matter is carried to the courts specially provided for such contingencies, usually very rare. In still rarer instances appeals are taken to an impartial chairman and from him to the full board of arbitration, representing the union, the manufacturers, and the general public.

So well has this method worked that many thousands of grievances have already been settled by it without recourse to the courts. In 1913–14, however, and again in 1915 controversies arose which threatened the life of this agreement. The first was over the manufacturers' demand that the union's chief clerk (Isaac A. Hourwich at the time) be changed, which was finally done. The second, which resulted in a temporary abrogation of the protocol by the Manufacturers' Association and a threatened strike on the part of the garment workers, involved the general charge of failure on the part of the workers' organization to live up to the protocol agreement. But a committee of public men, known as Mayor Mitchel's council of conciliation and presided over by Felix Adler, succeeded in extending the period of industrial peace enjoyed under the protocol.

The general effect of the protocol, now famous as the peace protocol, has been to substitute law for war in the clothing industry. Its benefits have accrued to workmen, manufacturers, and the public generally. Through it the garment workers have secured higher wages, shorter hours, and more sanitary conditions, the manufacturers better and more dependable help, and the public exemption from wasteful and often violent strikes and lockouts that periodically paralyzed not only the tailoring industry of New York but many dependent industries as well.

PRO′TO-DOR′IC, PROTO-ION′IC. Terms used to designate forms of architecture, especially of columns, which appear to have anticipated the later development of the Doric and Ionic forms of Greek architecture. The term "proto-Doric" is especially used of certain Egyptian types of column occurring in the façades of rock tombs at Beni-Hassan (twelfth dynasty) and in some early portions of the great temple at Karnak (eighteenth dynasty) which were supposed to have furnished the prototypes of the Greek Doric order. They resemble the latter in having polygonal or shallow-channeled shafts without bases, a circular echinus, and a square abacus. But the resemblance ceases here and modern archæology discredits the old theory that the Greek order was derived from the Egyptian. It is probable that the Greek type was in process of development before Greek intercourse with Egypt began in the seventh century B.C.

PRO′TOEP′IPHYTE. See EPIPHYTE.

PROTOG′ENES (Lat., from Gk. Πρωτογένης). A celebrated painter of ancient Greece who was born at Caunus in Caria and practiced his art at Rhodes. He was a contemporary of Apelles, working in the latter part of the fourth century. Pliny the Elder, to whom we owe most of our information (*Historia Naturalis*, xxxv, 83), says that when Demetrius Poliorcetes besieged Rhodes (305–304 B.C.) he took special care that the painter should be protected and undisturbed in his work. The ancient critics seem to have regarded his paintings as representing the highest art. They seem to have contained usually but few figures and to have shown but little creative power. His strength lay in execution, in minute labor and careful finish, rather than in composition.

PRO′TOGEN′ESIS. See SPONTANEOUS GENERATION.

PROTOGINE, prō′tȯ-jĭn (from Gk. *πρῶτος*, *prōtos*, first + *γίνεσθαι*, *ginesthai*, *γίγνεσθαι*, *gignesthai*, to become). Granite (q.v.) of gneissic structure composed of quartz, feldspar, and a greenish micaceous mineral belonging to the sericite or the chlorite family, which latter covers the lamination surfaces in a more or less continuous wavy membrane. The name "protogine" is applied chiefly to a rock mass of the Alps and is little used to describe rocks in other regions.

PROTOG′YNY. See POLLINATION.

PRO′TOHIP′PUS (Neo-Lat., from Gk. *πρῶτος*, *prōtos*, first + *ἵππος*, *hippos*, horse). An ancestor of the horse in the Miocene period. See HORSE, FOSSIL.

PROTONOTARY, prȯ-tŏn′ȯ-tȧ-rĭ *or* prō′tȯ-nō′tȧ-rĭ (ML. *protonotarius*, chief notary). The name properly given to each of the seven members of the Roman College of Papal Notaries, composed of prelates. They make up the first class; besides there are honorary protonotaries, who constitute a second class. The office of notary is very ancient, indeed primitive, for according to the *Liber Pontificalis* Clement I (91–100) appointed a notary for each two of the fourteen regions of Rome, making seven in all. The number was raised to 12 by Sixtus V (1585–90), but by the beginning of the nineteenth century they had lost all importance. The office was revived in 1838 and their duties were fixed by the constitution *Apostolicæ Sedis Officium* issued by Pius IX in 1872 and by the *Motu Proprio* of Pius IX in 1905. The original notaries were shorthand writers, using the *notæ*, or characters, 1100 in number, invented, it is said, by Ennius, the Latin poet. Later notaries were simply secretaries. Consult P. A. Baart, *The Roman Court* (Milwaukee, 1895), and E. L. Taunton, *The Law of the Church* (St. Louis, 1906).

PRO′TOPLASM (ML. *protoplasma*, from MGk. *πρωτόπλασμα*, first creation, from *πρῶτος*, *prōtos*, first + *πλάσμα*, *plasma*, creation, from *πλάσσειν*, *plassein*, to form). The living substance constituting the cells of plants and animals or forming the bodies of all one-celled organisms. In appearance it is like thin syrup, filled with highly refractive microscopic granules. It forms the physical basis of life, no living being existing without it; and all the phenomena or activities of life are based on this fundamental substance.

Chemical Constitution. Protoplasm largely consists of proteins, which are compounds of carbon, hydrogen, oxygen, nitrogen, and sulphur, associated with a large proportion of water. Besides proteids protoplasm contains small proportions of mineral matters, especially phosphates and sulphates of potassium, calcium, and magnesium, as well as sodium, iron, phosphorus, and chlorine found in the ash. It is dissolved by prolonged treatment with weak acids or alkalies. Strong alcohol coagulates it, as does heat. Proteids are unstable, and protoplasm, especially that of animal cells, decomposes with more or less rapidity and gives out a fetid odor. Protoplasm readily stains by the application of neutral or slightly alkaline solutions of carmine, logwood, or acid aniline dyes (eosin and acid fuchsin). Thus by the use of a carmine stain the chromatin in cells is clearly demonstrated. Protoplasm is usually, but not always, alkaline in reaction; red litmus paper is turned blue by it. Protoplasm is evidently a highly complex substance, but it is not known whether it is a definite chemical body or whether it is a varying mixture of different chemical substances. "Protoplasm," says Hertwig, "is not a chemical but a morphological conception," and the present organization of protoplasm is "the result of an exceedingly long process of development." For remarks upon the origin of protoplasm, see Spontaneous Generation.

General Properties. If we watch an amœba under the microscope we gather that protoplasm first of all is contractile and irritable; that it assimilates its food and is capable of excreting the waste residue; that it even respires, while it reproduces true to its species by self-division. Under a high power of the microscope the protoplasm of the egg of a starfish or sea-urchin, says Wilson, gives the appearance of a fine meshwork or framework composed of innumerable minute granules, or microsomes, suspended in a clearer, less deeply staining, continuous substance. The spaces of the meshwork (filar substance, spongioplasm, cell reticulum) are filled with a clear, homogeneous substance, not staining readily, and called the ground substance (interfilar substance, enchylema).

Movement and Irritability. This consists of the changes in the form of the body, e.g., of the amœba, or of the white blood corpuscles (leucocytes), whence such movements are called amœboid; while in the interior streams of granules are seen passing along the body and in the pseudopods. That irritability exists is proved by many facts, as that amœboid movements and the flow of granules can be induced, stopped, or modified by mechanical, chemical, and thermal stimuli.

Nutrition and Assimilation. Irritability and the power of motion are essential in bringing about assimilation, which is the change of food substance into protoplasm. Most unicellular animals, as well as the white amœboid blood corpuscles, and certain cells in sponges, cœlenterates, etc., have been observed to take in or devour solid substances. They take the particles of food into the midst of the protoplasm of their bodies by flowing around them; they extract all the assimilable and reject the indigestible portions. (See Amœba.) Many Protozoa (q.v.), besides taking in food for their own growth and for replacing worn-out parts, have the power of producing substances, such as lime or silica, or in rare cases cellulose, forming hard coverings or shells, often many-chambered and wonderfully complex, as well as often richly ornamented. This formative power, says Hertwig, is the starting point in the formation of tissue.

History. In the eighteenth century Corti (1772) and later Treviranus (1807) had seen that the grains of chlorophyll which cause the green color of plants flow rapidly in the interior of cells of certain plants. Mohl discovered that this apparent motion of the chlorophyll grains was due to that of the substance in which they were contained. This substance Mohl in 1846 called protoplasm, while several observers (Siebold, Kölliker, Remak, etc.) afterward discovered movements similar to those seen in vegetable protoplasm in the lymph corpuscles of animals, and therefore Remak applied the same term "protoplasm" to the fundamental substance of animal cells. Meanwhile further knowledge of protoplasm was obtained by the study of certain Protozoa, and Dujardin in 1835 applied the name "sarcode" to the gelatinous granular contractile substance forming their bodies. Ferdinand Cohn in 1850 argued for the identity of sarcode and protoplasm. Finally Max Schultze, in 1861, and De Bary, as the result of prolonged investigations, proved the identity of the protoplasm of plants and animals with the sarcode of the Protozoa. Afterward the cell membrane was found by Nägeli, Leydig, Kölliker, Cohn, etc., to be of minor importance, the protoplasm being the essential, dynamic substance of the cell.

Consult Max Verworn, *General Physiology*, translated from the second German edition by F. S. Lee (New York, 1899); E. B. Wilson, *The Cell in Development and Inheritance* (ib., 1900); C. B. Davenport, *Experimental Morphology* (new ed., ib., 1908); Oscar Hertwig, *The Cell: Outlines of General Anatomy and Physiology*, translated by M. Campbell (ib., 1909). See Histology.

PRO′TOROHIP′PUS (Neo-Lat., from Gk. *πρῶτος*, *prōtos*, first + *ὄρος*, *oros*, mountain + *ἵππος*, *hippos*, horse). An ancestor of the horse in the Middle Eocene period. See Horse, Fossil.

PRO′TOROSAU′RI. See Prosauria.

PRO′TOSPON′GIA (Neo-Lat., from Gk. *πρῶτος*, *prōtos*, first + *σπογγία*, *spongia*, sponge). One of the earliest, if not the earliest, fossil sponges known. It consisted of a spherical body which now appears as a faint disk upon the surface of the rock, with the skeleton showing as a regular network of cross-shaped spicules that form square meshes. It is found in the Cambrian formations of North America and Europe.

PRO′TOTHE′RIA (Neo-Lat. nom. pl., from Gk. *πρῶτος*, *prōtos*, first + *θηρίον*, *thērion*, dim. of *θήρ*, *thēr*, wild beast). The lesser and inferior of the two primary divisions of the

Mammalia. It embraces only the small group represented at present by the Australian and Papuan egg-laying duckbill and echidnas, which constitute the order Monotremata (or Ornithodelphia), and possibly also the doubtful and little-known fossil group termed Allotheria or Multituberculata. The mammalian affinities of these extinct forms have been denied by some paleontologists, but the weight of opinion views them as properly included in that category. Both externally and internally the monotremes show much that is distinctly mammalian, including the character of the brain, which in the echidnas at least is surprisingly large and well convoluted. The absence of a corpus callosum is the chief peculiarity differentiating it from the eutherian brain. The skeleton exhibits many archaic features, one of the most striking of which is the presence of only the capitular head to the ribs. The shoulder girdle has other reptilian features and a bone (the interclavicle) peculiar to the group. The digestive and circulatory systems differ little from the normal mammalian type, and the great distinction between the Prototheria and other mammals lies in the reproductive system and the fact that their eggs, instead of being minute and with little or no food yolk, are large, contain much yolk, and therefore develop, so far as their early stages are concerned, after the meroblastic manner of a reptile's egg. The Prototheria have a temporary ventral mammary pouch in which the young are hatched, or to which they are transferred after hatching, and into which open the ducts of the mammary glands. This pouch is formed by a deep fold of the skin periodically developed in preparation for the young, and contains no teats, but nutrition is supplied by modified sweat glands. Its homologies are fully discussed by Beddard (*Mammalia*, 1902), who refers to the work and writings of many investigators. See DUCKBILL; ECHIDNA; MAMMALIA.

PROTOXYLEM, prō′tō̇-zī′lĕm (from Gk. πρῶτος, *prōtos*, first + ξύλον, *xylon*, wood). The first vascular elements appearing in a stele, usually being spiral vessels. The position of the protoxylem strands and their relation to the xylem subsequently developed (metaxylem) have been of great use in tracing the evolution of the vascular system and of vascular plants.

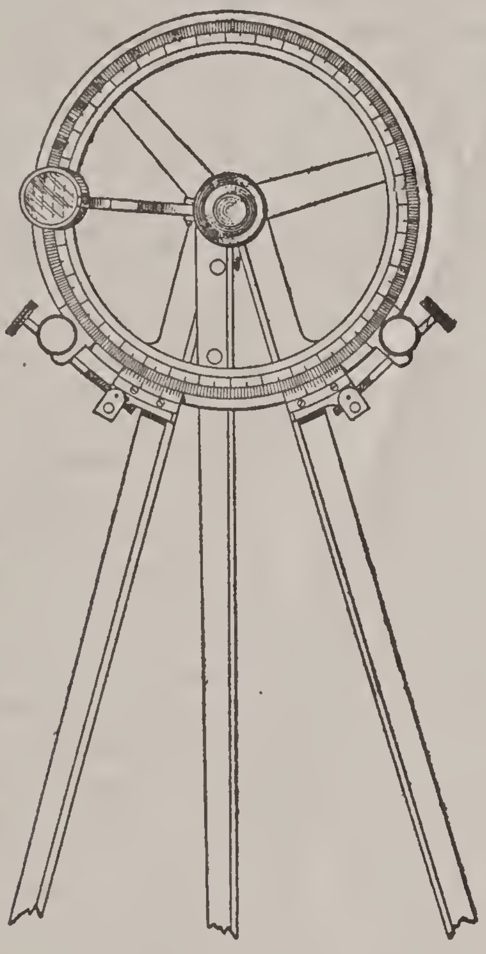
PRO′TOZO′A (Neo-Lat. nom. pl., from Gk. πρῶτος, *prōtos*, first + ζῷον, *zōon*, animal). The subkingdom or phylum of one-celled animals, represented by the amœba (q.v.), infusoria, and the like. They are, as a rule, of microscopic size, and are like particles of protoplasm (q.v.), having a gliding motion and constantly changing their form. Protozoa consist of a single cell, and, with the exception of the moners (see MONER), they possess one or more nuclei, but no other organs or true tissues. As the entire body is composed of protoplasm, the simplest protozoan is contractile, absorbs and digests food, is metabolic, automatic, and reproduces by self-division. Motion is brought about not only by the general contraction of the body, but also by means of pseudopodia (see AMŒBA), cilia, and a specialized cilium called flagellum, while in the most specialized infusoria, such as *Vorticella* and *Stentor*, little muscular fibrillæ have been detected. Besides the nucleus and food vacuoles there are other cell organs called contractile vacuoles, which occur in fresh-water forms and only rarely in marine species. They apparently perform an excretory function, and may be respiratory, since they are supposed to eliminate carbon dioxide. All the vital functions appear to be under the control of the nucleus. Protozoa reproduce by self-division or budding, or they conjugate, multiplying by spores or germs. (See REPRODUCTION; SEX.) They may be naked or may secrete a calcareous shell consisting of one, two, three, or many chambers; in the latter case (the Foraminifera) the shell is remarkably complex considering the great simplicity of the animal itself. Apparently the same mechanical laws guide the mode of shell formation, the chambered shells being irregular, or straight, or twisted, or coiled in a single plane, like the chambered nautilus. While a very few forms are terrestrial (*Amœba terricola*), the vast majority are marine and fresh-water forms, the shelled forms being marine. The fresh-water forms abound most in still or stagnant water, and may become encysted when the water dries up or when food is lacking or cold approaches. Thus protected by a thin resistant outer covering, the monads and infusorians in general may dry up and be blown about by the winds, remaining suspended in the air for a long period. In this way the species have become more or less cosmopolitan. A large proportion of American forms are of the same species as those of Europe.

The discoverer of the microscope, Leeuwenhoek (q.v.), in 1764 first detected and described certain forms living in infusions, and about the same date Wrisberg (*Observationes de Animalculis Infusoriis*, Göttingen, 1765) called them infusorial animalcules. The name Protozoa was given in 1845 to the subkingdom by Siebold, who discovered that they were unicellular, disproving Ehrenberg's claim that they possessed a digestive canal, nervous system, muscles, excretory and sexual organs. The earliest traces of shelled Protozoa are those of *Globigerina* and *Orbulina* detected by Matthews in the Lower Cambrian rocks of St. John, New Brunswick.

Classification. The phylum Protozoa is divided into five classes: (1) Rhizopoda; (2) Mycetozoa; (3) Flagellata (Mastigophora); (4) Sporozoa; (5) Infusoria. Of these the Sporozoa are all parasitic, while the malarial germ is a protozoan of doubtful position, its young being provided with flagella.

Consult: E. R. Lankester, *A Treatise on Zoölogy*, part i (London, 1903), containing a bibliography; M. M. Hartog, "Protozoa," in *Cambridge Natural History*, vol. i (New York, 1909); E. A. Minchin, *Introduction to the Study of the Protozoa* (ib., 1912); also G. N. Calkins, *Protozoa* (ib., 1901). See FORAMINIFERA; RADIOLARIA.

PROTRAC′TOR (ML. *protractor*, from Lat. *protrahere*, to draw forward, from *pro*, before, for + *trahere*, to drag, draw). An instrument used for measuring and laying down angles on paper. In its simplest form it consists merely of a semicircular scale of metal or transparent material. The three-arm protractor used in marine surveying is used to solve mechanically the three-point problem. The middle arm is fixed with its reading edge at the zero of the scale; the other arms, pivoting at the centre of the instrument, are arranged to measure angles on each side of the middle arm; the movable arms carry verniers. The method of using the protractor is as follows: three objects (whose positions are marked on the chart or map) are selected. The angle between the right and centre objects and that between the centre and left are measured with sextants or similar instruments. The angles so obtained are transferred to the protractor, which is then laid upon the chart, and, with the edge of the centre arm always kept on the marked position of the centre object, the instrument is slipped along until the side arms fall upon the positions of the other two. The centre of the protractor then indicates the position occupied by the observer when the angles were taken, and crossed wires, a hole in a glass-ended tube, or a needle point serves to fix this position, which, if the angles are simultaneously observed, can be accurately ascertained even when the vessel carrying the observers is moving at any rate of speed. In selecting the point of observation care should be taken that the angles exceed 30 degrees if possible and that the point occupied is not near the circumference of the circle which passes through the points observed. If the angles are small a slight error in them is likely to produce a large error in the resulting position; and if the point occupied is on the circle passing through the three observed, its position is indeterminate.



THREE-ARM PROTRACTOR.

PROU, prōō, MAURICE (1861–). A French historian, born at Sens and educated in Paris, in the Ecole des Chartes and the Ecole des Hautes-Etudes. After some time at the French School at Rome, Prou entered the numismatic museum of the National Library, and he became professor of diplomatic relations at the Ecole des Chartes in 1900. In 1910 he was elected to the Academy of Inscriptions and Belles Lettres. He edited *Le moyen âge* (1893 et seq.). Besides editions of Hincmar (1884) and of Honorius' registers, his most important works are: *Raoul Glaber* (1886); *Manuel de paléographie, latine et française* (1889; plates, 1892 and 1896; 3d ed., 1910); *Catalogues des monnaies françaises* (1892 et seq.); *La Gaule mérovingienne* (n. d.); *Les monnaies carolingiennes* (1896); *Recueil des actes de Philippe Ier* (1908).

PROUD FLESH. The popular term for exuberant granulations (see GRANULATION) springing up in wounds or on ulcerated surfaces. Such granulations may be treated with silver nitrate either in the solid form or in strong solution, or they may be removed with the scissors or curette. See INFLAMMATION; LUNAR CAUSTIC.

PROUDHON, prōō'dôɴ', PIERRE JOSEPH (1809–65). A French Socialist and political writer, born at Besançon, July 15, 1809. He was educated at the College of Besançon, where he proved himself an able student, but on account of the poverty of his parents he was compelled to leave before receiving his degree. In 1828 he obtained employment in a large printing establishment in his native city, and after eight years he set up one of his own, which was not successful. In 1838 he published his *Essai de grammaire générale,* which secured him a triennial pension of 1500 francs from the Academy of Besançon. In the same year he removed to Paris. Here in 1840 he published *Qu'est-ce que la propriété?* (translated by Tucker, Philadelphia, 1888), in which he sums up his doctrines in the celebrated dictum, *La propriété c'est le vol.* At the moment of publication the work attracted little notice, and the sole results to its author were the withdrawal of his pension by the Academy, on the score of his noxious opinions, and the threat of prosecution. In 1842, for a repetition of the offense in his *Avertissement aux propriétaires,* he was prosecuted before the Cour d'Assises of Besançon, but succeeded in obtaining an acquittal. From 1844 to 1847 Proudhon was employed at Lyons in the superintendence of a scheme of water transport on the rivers Saône and Rhone, publishing during this time at Paris the two works entitled *De la création de l'ordre dans l'humanité* and *Système des contradictions économiques.* On the outbreak of the revolution of February, 1848, Proudhon repaired to Paris, and on April 1 came before the public as editor of the *Représentant du Peuple.* By his vigorous advocacy of extreme democratic and Socialistic opinions he became one of the leading figures of the hour. His paper was suppressed in August; but meantime, on June 4, he had been elected to the Constituent Assembly as representative of the Department of the Seine. In that body he had comparatively little influence; he attached himself to no political party, but attacked the radical Left and the reactionary Right with equal bitterness. His importance as a writer was much greater, and as editor of three daily journals in succession he had great influence upon the political movements. All three papers were in turn suppressed as anarchistic and obnoxious—*Le Peuple* (Nov. 23, 1848–April, 1849), *La Voix du Peuple* (October, 1849–May, 1850), *Le Peuple de 1850* (June 15–October 13). During their continuance Proudhon was repeatedly subjected to fines, which were defrayed for him by popular subscription. In January, 1849, he attempted to put his theories into practice by the institution of a people's bank. The bank was closed by the authorities, and its originator fled to Geneva to escape threatened imprisonment. In June, however, he returned, and his next three years were passed in the prison of Ste. Pélagie. While confined there he married. In June, 1852, he was set at liberty and, quitting Paris, went to Belgium, where he continued to publish from time to time on his favorite subjects. He returned to Paris after the amnesty of 1860 and died at Passy, Jan. 16, 1865.

Proudhon's theories are best set forth in his works *Qu'est-ce que la propriété?* and *Système des contradictions économiques.* Property, he declared, is unjustifiable either on the ground of occupation, which can entitle the possessor only to the usufruct, or on the ground of labor, which presupposes occupation. The individual has a right only to the integral product of his labor. One service can be duly repaid only by rendering another; but the owners of land and capital exact many services while rendering none.

His political programme was equally revolutionary. He was the founder of a school of individualistic or philosophical anarchy. He declared that the state, representing unintelligent conservatism or brutal reaction, must be abolished. The revolution for the betterment of humanity must come, not from above, through the government, but from below, through the individual.

In the history of French thought and Socialism Proudhon occupies an important position. His destructive criticism was of value; but he also elaborated numerous propositions which are regarded as positive acquisitions by economists and Socialists. He gave to federalism and anarchy a doctrine; he conceived of a democratic organization of credit; he outlined the Socialistic theories of value, of rent, and of the right of the laborer to the whole product of his labor. His theories were of great influence upon three important movements—the revolution of 1848, the Commune of 1871 (many of the principal actors in which held his opinions), and the International Workingmen's Association. Moreover, many organizations of workingmen, especially in France, still look for their intellectual leadership to Proudhon. Among his works, in addition to those already mentioned, are: *Explications présentées au ministère public sur le droit de propriété* (1842); *Solution du problème social* (1848); *Banque du peuple* (1849); *Actes de la révolution: résistance* (1849); *Les confessions d'un révolutionnaire* (1849); *Intérêt et capital* (1850); *Idée générale de la révolution au XIXème siècle* (1851); *Philosophie du progrès* (1853); *La guerre et la paix* (1861); *De la capacité politique des classes ouvrières* (1865).

Consult: Putlitz, *P. J. Proudhon: sein Leben und seine positiven Ideen* (Berlin, 1881); Diehl, *P. J. Proudhon: seine Lehre und sein Leben* (3 vols., Jena, 1888–96); Desjardins, *P. J. Proudhon: sa vie, ses œuvres et sa doctrine* (2 vols., Paris, 1896); Mülberger, *P. J. Proudhon: Leben und Werke* (Stuttgart, 1899); Célestin Bouglé, *La sociologie de Proudhon* (Paris, 1911).

PROUST, pro͞ost, Antonin (1832–1905). A French politician and author, who sometimes wrote under the pseudonym of Antoine Barthélemy. He was born in Niort and, after an excellent education and travels in Greece, entered journalism and in 1864 founded at Brussels *La Semaine Universelle,* in which he bitterly opposed the Empire. Proust became Gambetta's private secretary after the fall of the Empire, and was elected deputy in 1876 and repeatedly reëlected. From November, 1881, to January, 1882, he was Minister of Fine Arts under Gambetta. The Museum of Decorative Arts was the result largely of his efforts. He was the Commissioner General of Fine Arts at the Exposition of 1889 and French Commissioner General to the World's Columbian Exposition of 1893. His chief works are: *Les beaux-arts en Angleterre* (1862); *Un philosophe en voyage* (1864); *Chants populaires de la Grèce moderne* (1866); *La democratie en Allemagne* (1872); *Le prince de Bismarck* (1876); *L'Art français* (1890); *L'Art sous la république* (1891); and critiques of the Salons of 1898 and 1899.

PROUST, Joseph Louis (1754–1826). A French chemist, born at Angers. He studied chemistry there and in Paris and became chief apothecary to the Salpêtrière. He went to Spain, becoming professor of chemistry at the artillery school at Segovia and later director of the laboratory of King Charles IV. In 1806 he returned to Paris and in 1816 was elected to the Academy of Science. Proust put on a firm basis the chemical law of definite proportions, sometimes called Proust's law; discovered glucose (1805)—*Mémoire sur le sucre de raisin* (1808); and greatly advanced the art of quantitative analysis. See Proustite.

PROUSTITE, pro͞os′tīt (named in honor of Joseph Louis Proust). A mineral sulpharsenite of silver that crystallizes in the hexagonal system. Its lustre is adamantine to metallic and it shows a bright-red color by transmitted light. It is found in Saxony, Bohemia, Spain, Mexico, South America, and in the United States at various localities in Colorado, Arizona, and Nevada, in association with the silver ores of these regions. Both proustite and pyrargyrite (q.v.) are known as ruby silver ores in allusion to their transmitted color.

PROUT, Ebenezer (1835–1909). An English musical theorist, born at Oundle, Northamptonshire. He taught composition at the National Training School for Music and the Royal Academy of Music. His scholarly and exhaustive treatises on the various branches of musical composition assure him a place among the great theorists. His most important books are: *Harmony* (1889); *Counterpoint* (1890); *Double Counterpoint and Canon* (1891); *Fugue* (1891); *The Orchestra* (1898–99). His numerous compositions are models of masterly writing, but lack inspiration.

PROUT, Father. See Mahony, Francis Sylvester.

PROUT, Samuel (1783–1852). An English landscape and architectural painter in water color, also a lithographer. He was born at Plymouth, studied under a local teacher, early contributed to Britton's *Beauties of England,* and spent two years in London with Britton. His real artistic activity began in 1818 with his travels on the Continent, which were continued throughout his career. He made sketches in Belgium, France, Germany, Italy, and Switzerland, excelling particularly in rendering northern Gothic architecture, to which his peculiar touch and broken line were especially adapted. His work possesses great charm and spontaneity, and shows a happy sense of composition, love of the picturesque, skillful handling of light and shade, and keen appreciation of values. Life and movement are added by the introduction of picturesquely clad figures. He is represented in the Tate Gallery and many of his drawings in water color, sepia, and pencil are in the South Kensington Museum. His later sketches were drawn by him on stone for lithography and published in volumes under the titles, *Facsimiles of Sketches Made in France and Germany* (1833); *Interiors and Exteriors* (1834); *Sketches in France, Switzerland, and Italy* (1839), etc. He also published numerous elementary drawing books. Consult "Sketches by Samuel Prout," edited by Charles Holme, published as a special number of the *International Studio* (New York, 1915).

PROUTY, Charles Azro (1853–). An American lawyer and transportation expert, born at Newport, Vt. He graduated from Dartmouth College in 1875, for two years assisted Prof. S. P. Langley (q.v.) in the Allegheny (Pa.) observatory, and was admitted to the Vermont bar in 1882. In 1888 he was elected to the State Legislature, and from that year to 1896 was reporter of the Vermont Supreme Court. After 1896, when President McKinley appointed him a member of the Interstate Commerce Commission, Prouty became known as one of the ablest members of the commission; in 1912–13 he served as its chairman. Besides numerous articles Prouty wrote *Transportation—Every-day Ethics* (1910) and *The Trust Problem* (1911).

PROVENÇAL (prŏ̇′väɴ′sȧl′) **LANGUAGE.** A term which designates either the family of Romance dialects spoken in Provence (and neighboring districts), that part of southern France which was the Roman province called Provincia, or the dialect peculiar to Provence. It was the first in rank of the literary dialects of langue d'oc, its most ancient documents going back to the tenth century. Its literary development was stopped after the Albigensian Crusade (1209–1229), which crushed its patrons, the spoken language taking the rank of a patois and French becoming the literary language; but in modern times it has been successfully applied to literary purposes again by Mistral (q.v.) and other writers. From French, its northern neighbor, Provençal may, roughly speaking, be separated by a line which, starting from the mouth of the Gironde, follows the Dordogne for a while, then ascends to the north towards Isle-Jourdain, and, bending to the east as far as Montluçon, descends again in a southerly direction, crosses the Rhone, passes through the regions of Lyonnais and Dauphiné, and reaches the Alps. This line of demarcation serves also to divide it on the northeast from a linguistic territory known as the Franco-Provençal, because it has peculiarities savoring both of French and of Provençal. In the southwest of the territory to the south of the dividing line described is found a body of Gascon dialects, which in the Middle Ages were treated as forming a speech foreign to Provençal. The number of persons speaking the modern Provençal dialects (including Gascon) may be estimated at about 8,000,000. Provençal has often been called the *langue d'oc*, as contrasted with French, called the *langue d'oïl; oc* and *oïl* were respectively the Provençal and the Old French words for "yes."

What most distinguishes Provençal from French is the fact that it keeps the Latin accented *a* of free syllables and Latin unaccented final *a*, while French has changed them respectively to *é* and slurred or mute *e* (cf. Provençal *amat* and Old French *amét*, modern French *aimé;* Provençal *bona* and French *bonne*). In modern Provençal the final unaccented *a* has become *o*, and palatalized *l* has tended to become the palatal semivowel *y* as in French. Vowels which in French have been nasalized have in Provençal stopped short of nasalization: Latin *bonum*, French *bon*, but Provençal *bo*. The *l mouillé*, which has disappeared from modern French, still survives in these dialects. The word accent has always fallen on the last or the next to the last syllable, which is probably the reason why its final explosive consonants have been better preserved than in French (cf. Provençal *cap* with French *chef*). In the older period there was a case distinction of nominative and accusative for substantives, except those coming from the Latin first declension; thus, nominative singular *sor*, sister, accusative singular *seror*, nominative plural *serors*, accusative plural *serors;* nominative singular *cavaliers*, knight, accusative singular *cavalier*, nominative plural *cavalier*, accusative plural *cavaliers;* but nominative and accusative singular *domna*, lady, nominative and accusative plural *domnas*. In the modern speech the plural sign *s* is silent except in *liaison*. The four conjugations of Latin persisted in Provençal; but only the first (infinitive in *-ar*) and the fourth (infinitive in *-ir*) remained with sufficient vitality to attract new verbs to them. As in the earliest Old French, and as occasionally even nowadays in Spanish and Portuguese, the Latin pluperfect indicative (*cantaveram*, etc.) had in early documents an indicative value (either pluperfect or aorist, usually the latter); it had oftener, however, the imperfect subjunctive or conditional force that has prevailed also in the Iberian Peninsula.

The older speech, as represented in the literary works of the twelfth century, had eight simple vowels, viz., open and close varieties of *a*, of *e*, and of *o*, the high front vowel *i*, and a rounded form of this last vowel, written *u* as in modern French. Among the more common diphthongs were *ie, uo, ue*, and *au*. The retention of the Latin diphthong *au* is a characteristic of Provençal as compared with the other Romance tongues. The consonantal sounds comprised the velar stops *k* (written *c* before *a, o*, and *u*, and at the end of a word, as in *car*, why, *cort*, court, and *qu*, as in *que*, that, and *quino*, fifth) and *g* (written *gu* or more usually *g* before *a, o*, as in *garnir, guarnir*, to furnish, *g* before *u*, as in *agur*, augury, and *gu*, before *e, i*, as in *guerra*, war); the velar nasal with a value like that of the English *ng* in ring (written *n* before the *k* and *g* sounds already described, as in *tenc*, he held); the dental stops *t* and *d*, the former voiceless, the latter voiced; the voiceless sibilant *s* (written *s* and *ss*, the latter usually between vowels, as in *baissar*, to lower); the voiced sibilant *z* (written *z* or *s*, as in *chauza* or *chausa*); the dental spirant *th* (*th* of English there; written *d*, and after the middle of the twelfth century *z*, when it probably already denoted the *z* sound, as in *espaza*, sword); the dental nasal *n;* the palatalized *n* (written *n, ign*, etc., and more commonly in later times *nh*, as in *renhar*, to reign); a well-pronounced *r;* an *l;* a palatalized *l* (written *lh* or *ill*, as in *acolhir, acoillir*, to welcome); the labial stops *p* (voiceless) and *b* (voiced); the labiodental spirants *f* (voiceless) and *v* (voiced); the labial nasal *m;* the semivowels *y, u, ü* (represented by *i*, by *ou*, and by *u*, when they stood in hiatus). More complex sounds are *tš* (the English *ch* of church, i.e., a voiceless dental sibilant, represented by *ch* in all positions, and by *g* occasionally in the final position, as in *sapcha*, let him know, *tug* or *tuich*, all); *dž*, the voiced equivalent of the preceding sound (the English *j*, represented by *j* and, before *e* or *i*, by *g*, as in *gen*, gentle, *joglar*, minstrel; the manuscripts often have graphic *i* for *j*); a voiceless dental sibilant *ts* (written *c*, as in *marce*, and *z* or *tz*, especially in the final position, as in *faz*, *fatz*, he does); and a voiced dental sibilant *dz* (written *z*, as in *dizem*, we say); as in French the last two sounds soon lost their dental component. In the literary documents final *n* is often omitted, and, on the other hand, it is often added to words that should normally end in a vowel; this ease of addition or omission has led to its being called the movable *n*. Even in the earliest times the Provençal region was divided into a northern and a southern linguistic district, the northern marked by the change of initial Latin *ca-* to *cha-* (*chastel*, castle), the southern by the retention of the *k* sound (*castel*) of the *ca-*.

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PROVENÇAL LITERATURE. The literature written in the various dialects of the south of France, and more particularly that written during the Middle Ages in the dialect of Limousin. Its earliest monument, a fragment of a moral poem called *Boëthius*, belongs to the first half of the eleventh century. The courtly lyrics, however, which constitute its main glory, were nearly all written between 1090 and 1350. The songs of over 400 poets who composed during this period have come down to us, and we know the names of almost 70 others whose works have perished. The troubadours (q.v.) wrote, not for readers, but for hearers; their pieces were sung at court festivals either by the authors themselves or by the more humble jongleurs. Music and words were usually composed by the same person. This intimate connection between words and music strongly influenced the form of these lyrics. Elaborate artificiality is a predominant trait. Every variety of rhyming scheme was attempted, the rhymes of one stanza being repeated in all the others throughout a poem. Word play, alliteration, conceits, and forced constructions abound, and difficulties of every kind were sought. There even grew up a style called the *trobar clus*, or *oscur*, the chief merit of which was that it could hardly be understood. A treatise on verse written in the fourteenth century (*Leys d'Amors*) mentions many different kinds of poems, the most important of which are the *vers* and *canso*, the *sirventes* and the *tenso*. Between *vers* and *canso* no very clear distinction has been observed, except that the *vers* was the earlier and simpler form. The *canso* was an elaborate lyric of from five to seven stanzas with complicated rhymes, and it dealt always with love and required a melody of its own. The sort of love thus treated was peculiar to the Middle Ages and seems to have been shaped by the social conditions of the period. The ladies who presided over the almost independent courts of southern France were the natural subjects of the praise and adoration of the singers, who expressed largely a feigned passion in artificial formulas. Yet, however innocent for the most part these love affairs actually were, the semblance of an illicit relationship was preserved. In general love is represented as the greatest good, the height of blessings, the source of all virtue and glory.

The *sirventes*, or service song, was written to fit some well-known and popular air. The subject was moral or religious, political or personal. The poet, with great freedom of language, scourges the vices of nobles or women or clergy, laments the decay of ancient manners and the growth of avarice, stimulates leaders and populace to war, exalts a patron for his political virtues and his generosity, avenges an injury by virulent personal invective, or exhorts laggards to the crusade. Without an intimate acquaintance with the events to which they relate, many of these pieces are now unintelligible, yet to the student of mediæval life they are most interesting, for they constitute the journalism of the age.

The *tenso*, with which may be included the *partimen*, *jocs partitz*, and *torneyamen*, was a poetical dispute, a play of wit, in which, often with biting mockery and intense personal bitterness, two or more poets debated, in alternate stanzas, some question of love casuistry, such as: Which are the greater, the benefits or the ills of love? Which contribute more to keep a lover faithful, the eyes or the heart? The decision is commonly left to some lord or lady. Such were the leading artificial forms of the Provençal lyric. There were, however, some others which retain a stronger impress of popular origin: the *alba*, or dawn song, portraying the parting of lovers; the *ballada*, *dansa*, and *ronda*, to be sung to the dance; the *pastorela*, copied some think from the French, a dialogue between a knight or a clerk and a shepherdess.

The earliest lyrical writer whose songs have been preserved is William IX, Duke of Aquitaine and Count of Poitou, but his pieces show such sure skill in treatment, such stability of language, metrical form and artistic character, as could not have been attained without the foundation of a considerable earlier literature. After the middle of the twelfth century the poets became numerous and their art soon reached its culmination. Among the most notable singers are: Marcabrun, distinguished for his biting satire; Jaufré Rudel, Prince of Blaia, hero of a romantic tale, charmingly dramatized by Edmond Rostand in his *Princesse lointaine;* Rambaut d'Orange, who exchanged love songs with Beatrice, Countess of Die; Peire Rogier, who excelled in exaggerated devotion to Ermengarde, the masculine Countess of Narbonne; Bernart de Ventadour, the greatest singer of love; Peire d'Alverhne, who wrote largely in the difficult style; Arnaut de Mareuil, referred to by Petrarch, in comparison with Arnaut Daniel, as "the less famous Arnaut"; Guiraut de Borneil, "the master of the troubadours"; Peire Vidal, an erratic genius; Bertran de Born, often called, on account of his stirring war songs, the Tyrtæus of Provence and put by Dante into hell among the stirrers of dissension (*Inf.*, xxviii); Folquet de Marseille, who sang of love in his youth, then entered the Church, rose to be Bishop of Toulouse, and was one of the most ferocious persecutors of the Albigenses; Pons de Capdueil, Rambaut de Vaqueiras, and Peirol, all three lovers and crusaders; Arnaut Daniel, whom Dante met in the last circle of Purgatory and whom he regards as the greatest of all poets of love (*Purg.*, xxvi); Raimon de Miraval, who sang light-heartedly of amorous intrigues while his country was being devastated by a cruel war and ruin stalked through the land.

After the beginning of the thirteenth century the Provençal lyric rapidly declined. Moral poems largely took the place of songs of love and war. Among the writers worthy of mention are: Aimeric de Peguilhan, the favorite of many nobles; Peire Cardinal, master of the moral *sirventes;* Sordello, the Mantuan, made famous by Dante and Browning; and Guiraut Riquier, who may well be regarded as the last of the troubadours.

The fall of this brilliant literature began with the Albigensian Crusade of 1209, which soon turned into a savage war of conquest and ended in the absorption of the fiefs of the south by the French monarchy. The elegant and liberal life of the Provençal nobility, the fount from which this lyric drew all its vitality, was destroyed. The stream of court poetry was dried up at its source. Even the language was condemned by authority. The culture of the region became entirely French, and the *langue d'oc* declined into a mere group of dialects, with a dialectal literature. The poets took refuge in Catalonia, Aragon, and Italy, where for another century their profession flourished.

The art, abandoned by the aristocracy, was taken up by the citizens of the towns. In 1323 seven burghers of Toulouse founded the Sobregaya Companhia dels VII Trobadors de Tholoza, the purpose of which was to further their native poetry. This company developed into a formal society with many sharply defined grades of membership. Their chancellor prepared in 1355 a manual of poetic art, the *Leys d'Amors*, degrees of bachelor and doctor of the gay science were conferred, and annual competitions in song were held, called the Floral Games, from the fact that gold and silver flowers constituted the prizes. The pieces composed for these competitions celebrated the Virgin under the names *Amors* and *Clemenza,* the stereotyped love formulas of the ancient poets being employed in the service of religion. Being written according to rule, these poems are uninspired and of small literary value.

Lyric poetry, though the most important, was not the only manifestation of Provençal literature. Almost all the mediæval forms are to be found. There are epics, mostly fragmentary, the most important of which is *Girart de Rossillon;* Arthurian romances, such as *Jaufré;* short versified tales, called *novas*, which are interesting chiefly as presenting the life of the age; and one long and highly artificial love story, *Flamença*, which represents the impossible wooing and conquest of a married lady by a young knight. *Flamença* has kept for us a most valuable picture of Provençal manners before the year 1235, when it was probably composed. Some historical poems are also of importance, among which may be mentioned the *Chanso d'Antioche*, dealing with the First Crusade, and two long fragments on the Albigensian War. A few fables, hymns, prayers, allegories, epistles, and lives of saints remain; also a great mass of moral, didactic, and scientific verse, much of which is still unpublished. To this class belongs an immense work, a sort of encyclopædia, the *Breviari d'Amors* of Matfre Ermengaud, which consists of over 34,000 lines. Of the drama little has been preserved, and of that little none is earlier than the fourteenth century.

Compared with the poetry, Provençal prose is weak and poor. We have some translations of parts of the Bible and of legends of the saints, some chronicles, some quasi-scientific treatises, and works on grammar (*Donat Provensal*, of about 1243, *Las Razos de Trobar*) and poetics (*Las Leys d'Amors*, of about 1356). The most interesting bit of prose is the *Biographies of the Troubadours*, containing more than 100 lives, together with *razos*, or stories explaining the circumstances under which particular poems were composed. This work, however, is untrustworthy. Many of the notices are romantic tales, products of the imagination, built wholly upon the poems they are designed to interpret.

Provençal literature, it will be seen, is of slight value apart from its lyric poetry, but this lyric poetry is one of the most important artistic manifestations of the Middle Ages. Poor as it was in ideas and sentiments and empty in its courtly refinement, it was original. Very few outside influences were at work at its rise or in its development. It was the spontaneous outgrowth of chivalric manners and institutions acting under favorable conditions upon a race prone to melody. Its fundamental aridity is offset by variety of form, courtly refinement, and superior musical qualities. Though almost without known ancestry, it was not without known offspring. France, Germany, Spain, and Italy echoed its tones and imitated its conventional forms. In Germany, however, a native spirit soon mastered the minnesingers, and in Italy a school of thoughtful and cultivated writers developed the love theories of

Provence till they were fit for the hand of Dante.

For modern Provençal literature, see FÉLIBRIGE.

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PROVENCE, prō̍′väɴs′ (Lat. *Provincia*, province). Formerly a province of southeastern France, comprising the present departments of Basses-Alpes, Var, and Bouches-du-Rhône, and parts of the departments of Vaucluse and Alpes-Maritimes. The name Gallia Provincia, or simply Provincia, was given to the country by the Romans, who, about 120 B.C., subdued the territory later constituting Provence, Dauphiné, and Languedoc. Aquæ Sextiæ (Aix) was the capital of the new province. During the movement of Germanic peoples in the fourth century the Roman power and the name Provincia were restricted to the southeastern portions of this territory lying between the Rhone, the Durance, and the Mediterranean Sea, and with the fall of Arles about 480 this portion, too, passed into the hands of the Visigothic invaders. After being held from 510 to 536 by the kings of the Ostrogoths, the region passed to the Frankish kings, in whose many partitions it was repeatedly parceled out. It was saved from the Saracens by Charles Martel (c.739). By the partition of Verdun Provence fell to Lothair; it was seized by Charles the Bald in 875, and in 879 attained the rank of a kingdom under Boso, being known as the Kingdom of Provence, or Cisjurane Burgundy. (See BURGUNDY.) This was united with Transjurane Burgundy in 933 to form the Kingdom of Arles, which existed for 100 years. Soon after the extinction of the Arletan realm the counts of Provence became hereditary feudal princes. They ruled in practical independence until 1112, when, upon the failure of male issue, the county passed to Ramon Berenguer (Raymond Berengar), Count of Barcelona, whose male line became extinct in 1245 in the person of Ramon Berenguer IV. His daughter, Beatrice, brought Provence in marriage to Charles of Anjou (q.v.), whose last direct descendant, Joanna I of Naples, made Louis of Anjou her heir (1382). Best known among the counts of the house of Anjou was René I (q.v.), the last of the troubadours, whose court became the home of a splendid culture. René left an only daughter, Margaret of Anjou, and in 1482 Provence fell to France, being formally annexed in 1486. In the life of the French nation the inhabitants of Provence have played their full share, exercising no inconsiderable influence on the development of politics, art, and literature. With the shrewd Norman, the wily Gascon, and the well-fed burgher of Touraine, the hot-blooded, poetic, eloquent Provençal ranks as one of the great national types, which has received concrete form in Alphonse Daudet's undying Tartarin.

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PROVENCE, COUNT OF. The title borne previous to his accession by Louis XVIII of France.

PROV′ERB (OF., Fr. *proverbe*, from Lat. *proverbium*, adage, from *pro*, before, for + *verbum*, word). A short, sententious saying long current in common speech. The last phrase, "long current in common speech," serves to differentiate the proverb from the multitude of happy expressions in literature which never become permanently fixed in popular usage. "Patience on a monument" is a happy phrase, often quoted by literary men, but it is not a proverb. "A bird in the hand is worth two in the bush" is a proverb. Another frequent characteristic of proverbs is alliteration or rhymes or rhythmic balance. Thus, "Where there's a will there's a way" shows alliteration; "Birds of a feather flock together" shows both rhyme and rhythm; and "Out of sight out of mind" shows rhythmic balance.

Whence comes the proverb? Lord Russell suggests the apparent origin in the phrase "the wit of one." Some one gives apt expression to a general truth or to an apparent truth; taken up by others, it spreads far and wide. St. Jerome is said to have originated "To make a virtue of necessity." In Sterne's *Sentimental Journey* occurs the fine English proverb, "God tempers the wind to the shorn lamb." And it is assigned either to Sterne or to the Bible, where it does not occur. It is found in George Herbert's *Jacula Prudentum* (1640), under the form, "To a close-shorn sheep God gives wind by measure." Herbert clearly took it from the French, "Dieu mesure le froid à la brebis tondue" (sixteenth century). From this point the proverb may be followed back to Provençal and Latin; and we find, too, the Turkish "God makes a nest for the blind bird." Sterne had come across the saying, clothed it in the aptest words, and made it immortal. As in this specific case the proverb is made by many hands. Like the ballad and the fairy tale it is impersonal and, like them, it goes back to the remotest times. The golden age of proverb making may well have been the age of the folk song. Its frequent metaphor and alliteration suggest this. Later times remold what comes to them. Among nations far advanced in civilization new proverbs are rare. The press throws off phrases of a proverbial character, but they do not often become a part of our speech. They serve their purpose and then disappear. It is the old phrases that we employ, as those relative to sour grapes, the gift horse, the prophet honored elsewhere than at home, haste and waste, honesty and policy. Except in certain cases, as in the examples just given, we do not usually quote proverbs at length, but some phrase or word from them. With these remnants our speech and our very best literature are pervaded. Shakespeare, e.g., refers to two proverbs in the same scene of the *Tempest* (ii, 2): "Good liquor will make a cat speak" and "He must have a long spoon who must eat with the devil."

As we have implied all countries have their proverbs as well as their folk songs. There is a rich mine in the East—Arabic, Persian, Hindustani, Japanese, and Chinese. "Where the corpse is, there the vultures gather," e.g., is an Indian proverb. Of ancient Hebrew proverbs a whole book is extant. The language of Christ and the Evangelists is ornamented with them. They were turned to the highest spiritual uses in the Sermon on the Mount. Roman proverbs, often relating to husbandry, inculcate frugality, patience, and independence. Italian proverbs are of various import, teaching now distrust and cynicism, now subtle wisdom and plain-dealing. Attention has frequently been called to the respect shown to the Devil in the Italian proverb; whereas in the Teutonic proverb—German, Dutch, and Scandinavian—he is a ridiculous figure. The Gallic wit of French literature is curiously absent from the French proverb.

Proverbs appear in Anglo-Saxon poetry, especially in the gnomic verses. At the Renaissance this fund of native philosophy was augmented by importation. In the early part of the seventeenth century appeared two notable collections of proverbs, partly English and partly foreign—George Herbert's *Jacula Prudentum* (1640) and the volume added to James Howell's *Lexicon Tetraglotten*, published separately in 1659 under the title "Proverbs or old Sayed Saws and Adages in English or the Saxon tongue, Italian, French, and Spanish; whereunto the British [Welsh] for their great antiquity and weight are added." Of all countries Spain possesses the largest and best store of proverbs. Don Juan de Iriarte (eighteenth century) collected at least 24,000. Cervantes hardly exaggerated the employment of them among the peasants when he made them crowd thick into the mouth of Sancho Panza and come out haphazard.

There now remains the question of the origin of the similarity between proverbs in various countries. Have those resembling one another a common ancestry? "One swallow does not make a spring" is current in some form among many peoples and was a proverb some 2000 years ago. Have all the forms of this proverb a common parent? Such a question cannot be safely answered. All that can be done is to attempt to settle the date when a proverb appears in different countries. The tendency, of course, is to say that all forms derive from the oldest. In many cases the investigation leads to the East, and it is perfectly evident that the native proverbs of Europe have been enriched from that source. The media of diffusion were the Bible, the Arabs in Spain, travelers in the East, and mediæval Latin literature. Still more easy is it to understand how proverbs have been exchanged by the peoples of western Europe and how Englishmen, Welshmen, and Irishmen have freely given and taken. In spite of all this it must be remembered that men's minds work in common ways. That one swallow does not make the spring or summer is a natural observation. The thought may have been expressed by a hundred different men far apart in space and time. So, too, it is not probable that "God tempers the wind to the shorn lamb" derives from "God makes a nest for the blind bird." On the other hand, "Where the carrion is, there the eagles gather," seems to be a variant of the Eastern "Where the corpse is, there the vultures gather."

See also Aphorism; Apothegm; Maxims; and consult John Morley's fine and suggestive essay, "Aphorisms," in his *Studies in Literature* (New York, 1897).

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PROVER′BIAL PHILOSOPHY. Essays in blank verse, on almost every emotion and condition of life, by Martin Farquhar Tupper, in four series, 1838–76.

PROVERBS, Book of. A book of the Old Testament, containing an anthology of gnomes and sentences, forming, in the Hebrew canon, the second book of the Hagiographa. Like Job and Ecclesiastes, it belongs to the Wisdom literature of the Hebrews. The form of these proverbs is manifold; similes, enigmas, theses and antitheses, wise sayings, and comparisons vary constantly. The book falls naturally into eight distinct sections, partially marked off by special titles: 1. Chapters i–ix, forming a kind of introduction to what follows and chiefly taken up with exhortations to the reader to follow wisdom and flee folly. In chapter viii Wisdom is personified and introduced as the speaker, while in chapter ix Folly is likewise personified and the two, Wisdom and Folly, are pictured as women, offering rival invitations and inducements to men. 2. Chapters x–xxii. 16, with the heading "Proverbs of Solomon," constitute the kernel of the collection. Each verse is complete in itself and forms an independent saying. 3. Chapters xxii. 17–xxiv. 22, a small separate collection distinguished from what precedes by a series of maxims that usually extend over several verses—generally two or three, though in one case as many as seven. The address, as in the first collection, is to a "son" and the exhortations are described as "words of the wise." 4. Chapter xxiv. 23–34, forming an appendix to the preceding and distinguished by a separate heading. 5. Chapters xxv–xxix, with the heading "These also are proverbs of Solomon collected by the men of Hezekiah, King of Judah." In this collection, again, each verse, as a general thing, forms an independent saying, though this principle is not consistently carried out. Some of the proverbs in this collection duplicate those found in the second. 6. Chapter xxx, with the heading "Words of Agur ben Jakeh," a series of enigmatical sayings. 7. Chapter xxxi. 1–9, exhortations addressed to Lemuel, King of Massa, by his mother, the main theme of which is a caution against wine and women. 8. Chapter xxxi. 10–31, an alphabetical poem devoted to the praise of the virtuous housewife.

It is evident from this survey that the Book of Proverbs is a combination of several distinct collections, to which furthermore a number of fragments from other collections have been added. It is ascribed by tradition to Solomon, but as other authors are mentioned, it is probable that some part was first assigned to him and the tradition then extended to the whole work. In 1 Kings v. 12 Solomon is said to have spoken 3000 proverbs. Some of these may have been preserved in x–xxii. 16, though even in this collection they have suffered much in transmission, and many new ones have been added. The references to the King in xxv–xxix, the insistence upon monogamy, and the attitude to the law preclude Solomonic authorship for this section, and the whole character of i–ix shows that it is a late introduction.

The Book of Proverbs represents in all probability a gradual growth that extended over a long period of time. Of the separate collections comprised in the book all the internal evidence points to the second as the oldest, while the fifth comes next. The first is later. The third and fourth divisions may be regarded as fragments which were added to x–xxii. 16, and similarly the sixth and seventh divisions are fragments added to xxv–xxix. The alphabetical poem (xxxi) is an independent composition of a late date. There is no reason to doubt that the words of Agur and Lemuel actually may have come from a north Arabian state Massa, though a fictitious ascription, as in Job, is also possible. Egyptian influence on the earlier collection has been suspected, as gnomic wisdom flourished in Egypt long before Solomon. The internal evidence, however, is insufficient for fixing the dates of compilation of the various divisions of the book definitely. As the latest date for the first section, and therefore the earliest possible date for the compilation in its present shape, we may fix upon 250 B.C. Many of the sayings are no doubt of popular origin, but the great bulk bear a scholastic character which points to their rise in literary circles.

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PROV′IDENCE (Lat. *providentia*, foresight, from *providere*, to foresee, from *pro*, before, for + *videre*, to see). A term of theology, including two elements, God's preservation and administration of the material universe and His moral government over His rational creatures. Both combine in the conviction that the universe and all its inhabitants move towards the end appointed by God, and that therefore man may trust His goodness and wisdom in the events of life. The doctrine has two aspects, religious and philosophical. The religious aspect is the earlier in history and the more important for practical life. Religion, as far back as it can be traced, included the belief that men could obtain the aid of higher powers who were able to mold the course of events to the good of men. The Hebrew religion, especially the prophets, strongly believed that the order of nature expressed the divine will and that man's destiny was also in God's hands. The early prophets even regarded all evil in life as being the punishment for sin, an extreme against which the Book of Job was a protest. Especially does the providence of God guide the history and destinies of the Hebrew race (Ps. cv; Hos. xi. 1 ff.), and often while free will is recognized, it is held that nothing takes place outside of the divine control; and the Jewish writers did not concern themselves to solve the philosophical problems of their position. The religion of the New Testament, with its emphasis on the fatherhood of God, naturally magnified the religious aspect of providence. God controls all things for good, and men may therefore trust His love and wisdom and need fear nothing. (Matt. v. 45, vi. 31–34, x. 28–31; Luke xii. 11–12; Mark xiv. 36; Rom. viii. 28–39; Phil. ii. 12–13; 1 Pet. v. 7.) The philosophical aspect of the doctrine arises whenever philosophy enters the realm of religious thought. Thus, Socrates, Plato, and the Stoics emphasized the idea of a world order working for good. Christianity, borrowing from both Hebrew and Greek thought, early added to its religious trust in God's providence a philosophical doctrine regarding it. Clement, Origen, and the other Greek fathers held that the very existence of God implied it. Augustine held that all things, even evil, are but working out the will of God, and that nothing can thwart His purpose. This has been the general position held in all branches of the Church, and is not essentially affected by discussions of the relation of sin to the will of God (see SIN; THEODICY), since all have believed in the final triumph of the will of God. The philosophical aspect has borne fruit in religion and furnished a basis in reason for a loving trust in God. Later theology divided providence into general and special, the first governing the order of the universe, the second, particular events of the life of men; and into ordinary and extraordinary, the first operating through natural causes, the last through miracles. In modern times the emphasis on the immanence of God and the development of the theory of evolution have only increased the grounds for a belief in providence. See PREDESTINATION.

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PROVIDENCE. The second largest city in New England, the capital of Rhode Island and the county seat of Providence County, 44 miles southwest of Boston and 188 miles northeast of New York (Map: Rhode Island, C 2). It is situated about 35 miles from the Atlantic Ocean, at the head of the Providence River, an arm of Narragansett Bay. Steamship lines connect with New York, Norfolk, Newport News, and Baltimore; the railroad facilities comprise the New York, New Haven, and Hartford and leased roads, and one transatlantic line, the Fabre from the Mediterranean, docks at the new State Pier.

The city lies on both sides of the Providence River, its easterly limits being marked by the Seekonk River, with an area of 18.29 square miles. Its early settlement was at the mouth of two small streams, the Woonasquatucket and the Moshassuck, whose confluence forms the Providence River. Separating the valley of these streams and the Seekonk River is a ridge about 200 feet high, which offers beautiful sites for residences. The larger part of the city is an extensive glacial sand plain which extends along the west side of the Providence River. The business district is in the centre of the city, and some of the finest business houses are built on made land. There are 248 miles of paved streets, two-thirds of this distance being laid with macadam. In the older part of the city the thoroughfares are narrow and crooked. Providence has 649 acres in public parks, among which is the noteworthy Roger Williams Park. This has been improved at a considerable expense and is a beautiful pleasure ground. It has a fine system of boulevards, an extensive sheet of artificial lakes, a museum, and a statue of Roger Williams. The Soldiers and Sailors Monument stands in front of the city hall, and near by is a statue of Gen. Ambrose E. Burnside. What Cheer Rock, on the Seekonk River, is of historic interest as the landing place of Roger Williams.

The city has set aside for a civic centre land valued at $3,000,000 and has converted it into a railroad entrance unusual if not unsurpassed in America. Exchange Place is the real centre of the city, and around this area the most notable buildings are being placed. The city hall stands at one end, opposite is the beautiful post office, and City Hall Park extends along the whole length of the plaza in front of the railroad station, while to the north of the station on rising ground stand the State Normal School and the new State House. The latter, first occupied in 1900, is a massive edifice of marble and granite and has a large dome. Other prominent structures are the public library, the county courthouse, the Roman Catholic cathedral of St. Peter and St. Paul, the Young Men's Christian Association Building, and the State Armory. Among business structures the Arcade is noteworthy, and there are a number of commodious office buildings of recent construction. Brown University (q.v.), with its large buildings on the east side, is one of the principal features of the city. Providence has several noted charitable institutions, among which are the Rhode Island Hospital, Rhode Island Homœopathic Hospital, Butler Hospital for the Insane, St. Joseph's Hospital, the Dexter Asylum for the Poor, and the State Institute for the Deaf. Besides Brown University the educational institutions include the Friends' School, which dates from 1818, the State Normal School, and the Rhode Island School of Design. The public library contains about 157,200 volumes. Other important libraries are the State Law Library and those maintained by the Providence Athenæum (over 70,000 volumes), the Rhode Island Historical Society, and the Rhode Island Medical Society. The Historical Society possesses also a collection of relics and the Athenæum some valuable pictures.

Providence is a port of entry, but is noted primarily for its manufacturing interests. For many years the wealth of the city was mainly derived from its commerce of the sea. About 1840 the city began to neglect its shipping interests, as the growing prosperity of its manufactures demanded attention. Large quantities of coal are handled at its docks, and the city controls extensive wholesale and jobbing interests. The relative unimportance of Providence in foreign commerce is due to the lack of sufficient depth in the harbor for ocean steamships and to inferior docking facilities. Otherwise the natural waterway through the Providence River and Narragansett Bay forms one of the best harbors on the New England coast. During 1914 an attempt to regain its former prestige in foreign commerce was instituted and a State pier capable of docking ocean steamers was opened. Providence is the first manufacturing city in Rhode Island, its products comprising nearly half of the total output of the State. The value of the products of her factories in 1909 was over $120,000,000. In the manufacture of jewelry Providence is among the leading cities of the United States; it is noted also for its extensive production of silverware, worsted and woolen goods, cotton goods, engines and boilers, machinery, including cotton milling machinery, fine tools, and files. Dyeing and finishing textiles, refining gold and silver, slaughtering and meat packing, and the manufacture of rubber and elastic goods, oleomargarine, malt liquors, etc., are other important industries.

The municipal government is vested in a mayor, elected annually, a bicameral council, consisting of a board of aldermen and a common council, and in administrative officers, the majority of whom are elected by the council. The council elects three commissioners of sinking funds, the park commissioners, and the license and fire commissioners. The commissioner of public works is appointed by the mayor. The city treasurer, harbor master, overseer of the poor, and school committee are chosen by popular vote. The personal property valuation of Providence in 1914 exceeded $132,000,000 and the real estate $212,000,000. The tax rate is $16.50 per $1000. Its largest items of expenditures were for schools, $1,038,051; for police department, $516,171. The water works, which were constructed at a cost of $7,100,000, are owned and operated by the city. Public bathhouses are maintained as a municipal activity. The bonded debt of the city in 1913 was $18,505,000, and the net debt, $12,061,000. Pop., 1800, 7614; 1850, 41,513; 1870, 68,904; 1880, 104,857; 1890, 132,146; 1900, 175,597; 1910, 224,326; 1915, 247,660. The total in 1910 included 76,303 persons of foreign birth and 5316 of negro descent.

Providence was founded and named in 1636 by Roger Williams, who, having been expelled from Massachusetts, came here and bought a tract of land from the Narraganset sachems, Canonicus and Miantonomoh. Here a distinct separation was made between spiritual and temporal affairs, complete religious toleration being unequivocally guaranteed. The first Baptist church in America was organized in 1638 under the ministry of Roger Williams. Williams secured in 1644 a parliamentary charter, under which Providence, Portsmouth, and Newport were united for governmental purposes as the "Providence Plantations in the Narragansett Bay in New England." In 1676, during King Philip's War, Providence was attacked by Indians and 29 of its 75 houses burned. Near Providence occurred in 1772 one of the first overt acts of the Revolution, the burning of the British cruiser *Gaspée*. In September, 1815, a tremendous gale forced the water back into the harbor and river, flooded part of the town, and destroyed property valued at over $1,000,000. Providence was incorporated as a city in 1832. Consult: W. A. Greene and others, *The Providence Plantations for Two Hundred and Fifty Years* (Providence, 1886); Bayles, *History of Providence County* (New York, 1891); "Providence," in L. P. Powell, ed., *Historic Towns of New England* (ib., 1898); H. K. Stokes, *Finances and Administration of Providence, 1636–1901* (Baltimore, 1903); William Kirk, ed., *A Modern City: Providence R. I., and its Activities* (Chicago, 1912). *The Early Records of the Town of Providence* have been printed in 15 volumes (Providence, 1892–99).

PROV'INCE (Lat. *provincia*, from *pro*, before, for + *vincere*, to conquer). A term used in geology to designate an area in which the deposition and succession of sediments are uniform. In paleontology it refers to a more or less well-marked district throughout which the animal or plant life was the same.

PROVINCE HOUSE. A brick mansion on Washington Street, Boston, built in 1679. It became the residence of the governors of the Province in 1715, and after many changes was burned in 1864. It is described in Hawthorne's *Twice-Told Tales*.

PROV'INCETOWN. A town in Barnstable Co., Mass., 54 miles by water and 120 miles by rail southeast of Boston, on Cape Cod Bay and on the New York, New Haven, and Hartford Railroad (Map: Massachusetts, G 4). It is situated at the extremity of Cape Cod and has a deep, spacious harbor. There are a public library, a fine town hall, and the Pilgrim Monument, 245 feet high. Provincetown has some reputation as a summer resort, but is best known for its fishing and whaling industries, the latter of which, however, has declined considerably. There are wholesale fish establishments, a number of fish-freezing and shipping plants, and manufactories of various kinds of oil. Pop., 1900, 4247; 1910, 4369. On Nov. 21, 1620, the Pilgrims in the *Mayflower* arrived in Provincetown Harbor and remained anchored there for nearly a month. It was here that the celebrated compact was signed and the first Governor, John Carver, was chosen. Permanently settled about 1680, Provincetown formed a precinct of Truro from 1714 until 1727, when it was incorporated. Its growth was very slow and in 1776 it had a population of only 205. Here during the Civil War the Confederate commissioners, Mason and Slidell, were delivered to the British gunboat *Rinaldo*. Consult Freeman, *The History of Cape Cod* (Boston, 1860–69), and H. D. Thoreau, *Cape Cod* (new ed., 2 vols., New York, 1908).

PROVING GROUND. An establishment maintained for the sighting and testing of ordnance and the testing of armor and projectiles. In the United States the army proving ground is on Sandy Hook, N. J., and the naval proving ground at Indian Head, on the Potomac River.

PROVINS, prō'văɴ'. The capital of an arrondissement in the Department of Seine-et-Marne, France, on the Voulzie, 59 miles by rail southeast of Paris (Map: France, N., J 4). The chief buildings are the eleventh-century Romanesque Gothic church of St. Ayoul; the twelfth-century Transitional church of St. Quiriace with its adjacent bell tower; the twelfth-century Grosse Tour, or keep of an ancient fortress; the church of Ste. Croix, town hall, and hospital dating from the thirteenth century; the sixteenth-century Tour de Notre Dame du Val, and several ancient dwelling houses. The town maintains a museum and public library, and has a public garden and pleasant boulevards. The culture of Provins roses is a local industry of repute; there are manufactures of confectionery and a trade in the mineral waters of its chalybeate springs. Provins was the Roman Pruvinum, and under the rule of the counts of Champagne in the Middle Ages was an industrial centre, it is recorded, of over 80,000 inhabitants. Its decay dates from the Hundred Years' War with England and the Religious wars. Pop., 1901, 8794; 1911, 8726.

PROVISIONAL ORDER (from *provision*, Lat. *provisio*, foresight, from *providere*, to foresee). In England, an order granted under powers conferred by an act of Parliament, by a department of the government, by the Secretary of State, or by some other authority, whereby certain things are authorized to be done, which could be accomplished otherwise only by an act of Parliament. The provisional order is, in fact, an ingenious device for relieving Parliament from the necessity of dealing directly with the enormous mass of local and other private legislation which modern conditions had imposed on it. The order does not become effective, however, until it has been confirmed by Parliament. Till that time it is purely provisional; and even after it has been so confirmed, and is in reality an independent act, it retains the title of a provisional order. See PARLIAMENT; PRIVATE BILL.

PROVISIONAL REMEDY. In the reformed procedure which has in the United States largely superseded the common-law procedure inherited from England, an extraordinary proceeding to prevent a dishonest defendant from disposing of his property before judgment and execution can be obtained in a civil action. The order is applied for at the time of commencing the action and as an incidental remedy. Under the New York Code and codes following it the principal provisional remedies are: order of arrest; warrant of attachment; temporary injunction; and the appointment of a receiver. See ACTION; PROCEDURE.

PROVISIONS OF OXFORD. See OXFORD, PROVISIONS OF.

PROVISIONS OF WESTMINSTER. See WESTMINSTER, PROVISIONS OF.

PROVI'SO (Lat., it being provided, abl. sing. of *provisus*, p.p. of *providere*, to foresee). In law, a clause in a legislative act, or in any legal instrument, which contains a qualification, limitation, or condition affecting or governing the preceding clauses. A common example of a proviso is the defeasance clause in a mortgage, the latter being in form an absolute conveyance, but with a proviso that if the mortgagor, or person who executes it, performs a certain obligation, then the instrument shall become null and void. A proviso is, in effect, an expressed condition. See CONDITION; DEED; MORTGAGE.

PROVI'SORS, STATUTE OF. The name of several statutes of England which were intended to prevent the Pope from presenting to benefices in England, or, as it was technically known, from using the rights of provision and reservation. Since the time of Innocent III (1198–1216) the Pope had frequently appointed foreigners to bishoprics and the like. Often these never lived in England, and merely sought to derive as much revenue as possible, leaving the ecclesiastical duties to others. Edward I in the Statute of Carlisle (1307) sought to prevent the heads of the great monastic orders from burdening the English monasteries with taxes, and by implication included the Pope in this prohibition. It was not, however, until 1351 that the first Statute of Provisors of Benefices was passed, which seriously aimed to check the various abuses. It was reënacted in 1362 and again in 1390, the last time with additional safeguards. For diplomatic reasons, however, the kings of England were compelled frequently to give way to the papal demands, and consequently the statute was in practice always suspended. Moreover, the King himself found it often convenient to override the rights of the cathedral chapters and obtain the appointment of a favorite to some benefice or other by employing the aid of the papal machinery. It was not until the breach with Rome took place in the reign of Henry VIII that the abuses which the Statute of Provisors sought to check ceased. The text of the statutes will be found in Adams and Stephens, *Select Documents of English Constitutional History* (New York, 1901). Consult also John Lingard, *History of England*, vol. iii (London, 1883), and Sir William Stubbs, *Constitutional History of England*, vols. ii and iii (6th ed., Oxford, 1897).

PRO'VO. A city and the county seat of Utah Co., Utah, 48 miles by rail southeast of Salt Lake City, on the Provo River and on the Denver and Rio Grande and the San Pedro, Los Angeles, and Salt Lake railroads (Map: Utah, C 2). It has the Brigham Young University, the largest educational institution of the Latter Day Saints, a Mormon tabernacle, Proctor Academy, a Carnegie library, county courthouse, Federal building, United States reclamation office, and the State Insane Asylum. Utah Lake, Mount Timpanogas, the Bridal Veil Falls, and the Provo Cañon are much visited for their scenic attractions. Provo is situated in an agricultural, fruit-growing, and cattle-raising region, manufactures woolen goods, flour, tin and iron roofing, etc., and has considerable trade in lumber and sugar beets. Settled in 1849, Provo was chartered as a city in 1851 and in 1910 adopted the commission form of government. Pop., 1900, 6185; 1910, 8925; 1914 (U. S. est.), 10,091.

PROVOKED HUSBAND, THE. A comedy begun by Vanbrugh as *A Journey to London* and left unfinished at his death. It was completed by Colley Cibber and published in 1728.

PROVOKED WIFE, THE. A comedy by Vanbrugh, produced in 1697. The rôle of the hero, Sir John Brute, a rough, mischievous fellow, was Garrick's favorite part.

PROVOOST, prō-vō', SAMUEL (1742–1815). First bishop of the Protestant Episcopal church in New York. He was born in New York City, of Huguenot descent, and was educated at King's (now Columbia) College. In England he continued his studies at St. Peter's College, Cambridge, and was ordained priest in 1766. He returned to New York and became an assistant minister of Trinity parish, a post he retained until 1774, when he withdrew. He declined to serve as delegate to the Continental Congress, though his patriotic impulses led him to join his neighbors in their pursuit of the British after the burning of the town of Esopus. He did not resume the active ministry until the close of the war, when, in 1784, he became rector of Trinity Church, New York, and in 1785 chaplain of the Continental Congress, then meeting in New York. Elected in 1786 first Bishop of New York at the Diocesan Convention, he was consecrated in England. In 1800 he resigned the rectorship of Trinity and the following year sought to relinquish his episcopal office, but the House of Bishops, declining to accept his resignation, appointed instead an Assistant Bishop. Consult W. S. Perry, *The History of the American Episcopal Church, 1587–1883* (Boston, 1885), and *The Centennial History of the Protestant Episcopal Church in the Diocese of New York, 1785–1885*, edited by J. G. Wilson (New York, 1886).

PROVOST, prŏv′ŭst (OF. *provost, prevost*, Fr. *prévôt*, from Lat. *præpositus*, principal, provost, p.p. of *præponere*, to set before, from *præ*, before + *ponere*, to place). The title of various academic, ecclesiastical, and civil officials. In England the heads of certain colleges, as of Oriel, Queen's, and Worcester at Oxford, of King's College, Cambridge, and of Eton College, are called provosts. In the United States this title is given to the heads of some institutions, as, e.g., the University of Pennsylvania. It is applied as an ecclesiastical title to the head of a cathedral or collegiate chapter, especially in Germany. The title is also given to the superiors of certain religious houses of lesser rank which bear a relation to the mother house analogous to that which a prior bears to an abbey. In the Catholic church he presides at the installation of canons, and acts of the chapter are valid only when signed by him. In the Protestant churches of Germany the title of provost is sometimes used as synonymous with that of dean or archpriest; and occasionally, where several minor churches or chapels are attached to one chief church, the minister in charge of the latter is called provost. The civil use of the title is found chiefly in Scotland, where the chief municipal magistrate of a burgh or city is styled provost. The provost presides in the civil courts together with the bailies, who are his assistants. The chief magistrates of the cities of Edinburgh and Glasgow are styled Lord Provost, and the claims of the provosts of Aberdeen and Perth to the designation of lord, although at one time contested, are now held to be fully established.

PROVOST MARSHAL. A military official in charge of the military police (q.v.) of a camp, garrison, or in the field. In the *Field Service Regulations, United States Army*, 1914, it is provided that "the defense commander of the area in and about the base of a line of communications is assigned as provost marshal." The functions of a provost marshal, in addition to those of general military police, are to receive and hold all classes of prisoners. He makes records of the prisoners of war, and collects and records the tags taken from the enemy's dead, as required by the laws and usages of war. The records of prisoners of war and of the enemy's dead are transmitted quarterly to the War Department. In the British army the provost marshal has a captain's rank, and authority to punish any offender taken *flagrante delicto* on the spot, according to the provisions and penalties laid down in the Mutiny Act.

In the navy the provost marshal is an officer attached to a naval court-martial who is responsible for the safe-keeping of prisoners under trial before the court; also for the serving of notices to witnesses and executing the processes of the court. He is usually an officer of the navy (not above the rank of lieutenant) or of the marine corps (not above the rank of captain), but in case of the trial of enlisted men a petty or noncommissioned officer may act as provost marshal.

PROXY (contraction of *procuracy*, from ML. *procuracia, procuratia*, charge, care, from *procurare*, to take care of, from *pro*, before, for + *curare*, to care, from *cura*, care). The agency of one person who acts as substitute for another, usually in public assemblies, conventions, and other bodies. It is now rarely permitted in legislative bodies, though formerly it was the privilege of English peers.

PRUDDEN, prụd′en, T(HEOPHIL) MITCHELL (1849–). An American pathologist, born at Middlebury, Conn. He graduated from the Sheffield Scientific School, Yale, in 1872 (M.D., Yale, 1875), and became an assistant (1879) and was professor of pathology (1892–1909) in the College of Physicians and Surgeons, Columbia University. In 1901 he was made a director of the Rockefeller Institute for medical research. His writings include: a *Manual of Normal Histology* (1881); a *Handbook of Pathological Anatomy and Histology* (1885; 9th ed., 1911), with F. Delafield; *Story of the Bacteria* (1889); *Dust and its Dangers* (1891); *Drinking Water and Ice Supplies* (1891); *On the Great American Plateau* (1907).

PRUDENTIUS, pro͞o-dĕn′shĭ-ŭs (AURELIUS CLEMENS PRUDENTIUS) (348–?405). The greatest poet of the early Latin Church and one of the leading literary figures of the fourth century. He was born in Spain (in Saragossa, Tarraco, or Calaguris). He received a liberal education, was admitted to the bar, practiced as a pleader, discharged the functions of a Roman magistrate, and received appointment to a high position at court. His early life was gay and dissipated, but after his conversion he devoted himself to the service of the Church, retiring to a monastery when 57. He lived in an age of great Christian leaders, among them Ambrose, Jerome, and Augustine, and from Ambrose he derived his impulse towards poetic composition. Among his poems the *Cathemerinon* (Daily Round) includes 12 hymns, of considerable length, designed for devotional use (Eng. trans. by R. M. Pope and R. F. Davis, New York). The *Psychomachia* (Soul's Conflict) pictures the battle which virtue and vice wage over the soul of a Christian. This is the earliest type of pure religious allegory in the Western Church, and may almost be said to mark an epoch in literary history. In the *Peri Stephanon* (The Crowns) we have a collection of 14 hymns in praise of martyrs and martyrdoms, about half of them dealing with Spanish subjects. The two books *Against Symmachus* carry on the battle already begun by Ambrose, against the proposed restoration of the altar of Victory to the senate house. Two of Prudentius' poems are distinctly theological, the *Hamartigenia*, on the origin of evil, and the *Apotheosis*, a defense of the doctrine of Christ's divinity. In both these works the influence of Tertullian is unmistakable. His works are in Migne, *Patrologia Latina*, vols. lix–lx (Paris, 1847). A new edition, edited by J. Bergman, is to appear in the *Corpus* of Vienna.

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PRUDHOMME, René François Armand Sully-. See Sully-Prudhomme, R. F. A.

PRUD'HOMMES, prụ′dôm′ (Fr., discreet men), Council of. Municipal tribunals which existed first in the Middle Ages at Marseilles, Lyons, and elsewhere in France, exercising an equitable jurisdiction as arbiters of trade disputes. Similar tribunals, under the same name, were reintroduced by Napoleon I in 1806 and were found to be of great practical utility. Under the present French Republic the system has been continued, the Conseils des Prud'hommes being citizens elected by the people irrespective of their connection with capital or labor.

PRUD'HON, prụ′dôɴ′, Pierre (1758–1823). A French historical and genre painter, one of the most eminent of the classical school. He was born in Cluny, the son of a stonecutter, and received his first instruction from the monks of the abbey of Cluny. Afterward he studied under Desvoges at Dijon, but an unfortunate marriage handicapped the painter in his youth. He worked in Paris with Wille, the engraver, and in 1784 won the Prix de Rome. In 1789 he returned to Paris, and, his genius being at first unrecognized, he supported himself by working for the booksellers, but finally was made painter in ordinary by Napoléon and given lodging in the Sorbonne. Under the influence of his friend and pupil Constance Mayer, he painted his best pictures, such as "The Rape of Psyche" (Louvre), "Venus and Adonis" (Wallace collection), and "Crime Pursued by Vengeance and Justice" (1808, Louvre) in which he displays unusual virility and grandeur of style, and for which he received the Legion of Honor. In 1816 he was elected to the Institute. After the suicide of Mademoiselle Mayer, in 1821, Prud'hon completed her picture, "The Unfortunate Family" (Louvre), and painted a few religious pieces, including "Crucifixion" and "Assumption" (both in the Louvre), but he never recovered from the shock and died two years later. Though he nearly always painted classical subjects, Prud'hon was one of the principal precursors of romanticism. In Italy he had studied Correggio and Leonardo, and his women have something of the subtlety of the latter master, as is shown in his portraits of the Empress Josephine, Constance Mayer, and Madame Jarre, all in the Louvre. Grace and charm of style, poetic invention, delicacy of coloring, and simplicity of conception make Prud'hon unique among the Classicists of his day. Consult: Clément, *Prud'hon* (2d ed., Paris, 1872); De Goncourt, *L'Art au XVIIIme siècle* (3d ed., ib., 1906); Salvator, "Prud'hon," in *French Art from Watteau to Prud'hon* (London, 1907).

PRUNE (Lat. *prunum*, plum, *prunus*, plum tree, from Gk. *προῦνον*, *prounon*, *προῦμνον*, *proumnon*, plum, *προῦνος*, *prounos*, *προύμνη*, *proumnē*, plum tree). Any variety of plum which can be successfully cured without removing the pit. Only those varieties which have a large proportion of solids, and sugar in particular, are considered good prunes. The prune industry was started in the eastern United States in 1854, but failed because the climatic conditions were not favorable for the production of the desired qualities. About 1863 the industry started in California and grew rapidly. In 1880 the output had reached 200,000 pounds annually and, in 1910, 150,000,000 pounds, of which nearly half is exported, thus developing in about 40 years an industry with an annual output greater than that of France, hitherto the chief prune-producing nation of the world. Oregon, Washington, and Idaho also grow good prunes, as do Servia, Bosnia, Germany, Spain, Australia, and South Africa. The value of prunes exported from the United States in 1914 was $4,662,000.

The prune may be cured in three ways. (1) Sun drying, the common and most economical way where climatic conditions will admit it. This is largely practiced in California, as well as in the European countries. The prunes are not picked until ready to fall, when they are gathered, graded, and dipped in hot lye or run through a pricking machine, after which they are spread on boards or wire-bottomed frames and put out to dry, an operation which takes from 8 to 12 days, depending upon the variety, the size of the plum, and the weather. (2) They are treated by evaporation, the drying being effected by fire heat. In this operation great care and skill are necessary, as too hot a fire will cause the fruits to burst, drip, and finally shrivel. If properly handled the evaporated product is superior to the sun-dried fruits. (3) The fruits in some European countries are partially cooked before being dried. Such prunes are softer than the sun-dried or evaporated ones. After being dried the fruit goes through a curing process by being thrown into bins or heaps to sweat, which takes from one to three weeks. After this they are ready for processing, which consists in dipping the fruits in boiling water and glycerin, steaming, or by rattling in a revolving cylinder. The object of this operation is to improve the color and appearance of the fruit and to destroy the eggs of any insect which may be upon them. They are then ready for packing, the best products being placed in boxes, although many are packed in bags.

PRUNE INSECTS. The insects which damage the prune are mainly those found on plums and peaches. See Peach Insects; Plum Insects.

PRUNING (from *prune*, from OF. *proignier*, *progner*, *provigner*, Fr. *provigner*, to prune, from OF., Fr. *provin*, vine, from Lat. *propago*, sucker, from *propagare*, to propagate, from *pro*, before, for + *pangere*, Gk. *πηγνύναι*, *pēgnynài*, to fasten). The removing of any part of a plant, either root, stem, or branch, to discourage growth in one direction and turn the energies of the plant in another. It is considered an artificial operation, but nature is a constant and very severe pruner, as is shown by the long, slender, limbless boles of many forest trees. When plants are taken from their natural environment and the forces which regulate their habits, pruning becomes a necessity. In this work the gardener must be guided by the well-known laws of plant growth governing the healing of wounds and the balance of parts. At planting time the tops of trees must be pruned in order to establish a proper relation of the top to the root, which is always unavoidably reduced in the process of digging. This pruning is necessary also because the roots have no intimate connection with the soil by which the demands of the expanding leaves can be supplied with food and moisture; in fact, the demands of the top should be less than the root can meet in order that a too severe strain shall not be placed upon the organism. Pruning may be performed for the purpose of correcting the habit of growth. The head may be made high or low, compact or open, at will, almost regardless of the natural habits of the tree. In general, however, the peculiar nature of the tree should be taken into account and the pruning made to conform as closely as possible to that form. Where fruit is the object sought the manner of fruit production of the plant must be thoroughly understood, otherwise pruning may induce wood growth at the expense of fruit production. For instance, apples and pears bear fruits upon spurs; peaches, usually on the young branches (sometimes on spurs) of the previous season's wood; grapes, on wood of the current year produced from buds developed the year previous. In order, therefore, intelligently to prune any plant for fruit production, its fruiting habit must be carefully considered. Sometimes desired results are obtained by root pruning or by cutting away a portion of the bearing wood. In the first case fruit bearing is induced, in the second the fruits are thinned or their number decreased, the food supply distributed to a lessened number which may be correspondingly increased in size. Pruning also admits light to the tree tops by removing superfluous branches, thus making the fruits higher colored.

Besides these objects pruning is used to change the form of head (heading in). Whatever be the object the operation should be performed in the manner least injurious to the plant. This involves the method of removing the branch and the time of year the work should be done. In regard to the season for pruning little exact information can be given. As a rule apples, pears, and cherries suffer least if pruned while in full vigor of growth. The wounds heal readily and there is less liability to loss of vitality than at other seasons. The peach should be pruned early and severely for wood growth, and late and lightly for fruit production; the same is also true of the grape. All pruning of the grape and peach should be confined to the resting period.

The manner of pruning so as not to lessen the vigor or shorten the life of the plant involves systematic annual pruning, by which the removal of large branches can be avoided. All cuts should be made close to and parallel with the main branch so as to promote the healing process. Large wounds must be covered with some preservative or protective coating to prevent decay. The healing of a wound is accomplished by the formation of a callous from the growing tissues. The process continues, and by the annual deposition of new material the wound is covered. A smooth cut will heal where a jagged cut or bruise will decay. Trees grown upon walls or espaliers require great skill in pruning in order to hold them within bounds and at the same time secure the maximum production of fruit or flowers.

Consult: L. H. Bailey, *The Pruning Book* (8th ed., New York, 1907); J. C. Newsham, *Propagation and Pruning of Hardy Trees, Shrubs, and Miscellaneous Plants* (ib., 1913); also publications of the national and State experiment stations.

PRURI'GO (Lat., itch). The name of a skin disease restricted to prurigo of Hebra, not including all conditions in which there is pruritus. Formerly dermatologists distinguished prurigo mitis, prurigo formicans, and prurigo senilis, which are now relegated to the eczemata and the lichens (q.v.). True prurigo, also called prurigo agria or ferox (the milder type is called prurigo mitis), begins in infancy or in childhood or youth, persisting with recurrences for many years. It resembles *urticaria* (q.v.). The eruption is usually at first a series of white or rosy plaques and is accompanied by intense itching. Then papules appear, as pale red points, excoriated at the summit, usually on the anterior and external portions of the legs and thighs, about the pelvis and buttocks, and also upon the upper extremities. The skin hardens and becomes thicker, furrowed with folds, and covered with crusts. Vesicles may appear, exuding yellowish serum, or sanguineous, and blackened. Impetigo, furuncle, abscess, and lymphangitis, all resulting from inoculation, may complicate the attack. Indolent lymphatic glandular enlargements may appear in the groin. The prognosis is very unfavorable. The disease may last for years or for a lifetime. Many cases are incurable. Asthma, emphysema, and chronic bronchitis are very common among the victims of prurigo. Diet, cod-liver oil, pilocarpine, carbolic acid, cannabis indica, and analgesics are helpful. Bran baths, starch baths, cod-liver oil, styrax, sulphur, ichthyol, beta naphthol and resorcin are among the local applications used. Consult Stelwagon, *Treatise on Diseases of the Skin* (Philadelphia, 1914).

PRURI'TUS. A functional skin disorder, characterized by itching, without structural changes in this tissue. Pruritus is a symptom of many diseases and is classed by neurologists among the parasthesias. The sensation may be of a tingling, pricking, or tickling character, or a feeling as if ants (whence the term "formication") or other insects are crawling over the skin. Pruritus is usually worse at night. When the disorder is local the regions usually attacked are the anus (pruritus ani) or the vulva (pruritus vulvæ). Generalized pruritus is a common symptom of jaundice, diabetes, Bright's disease, hepatic affections, digestive and intestinal disturbances, as well as of nervous diseases and inflammation of the female generative organs. Pruritus is occasionally a premonitory symptom of apoplexy, and may arise from brain tumors in the parts supplied from the seat of lesion. In certain persons a dose of morphine produces itching, especially about the nose. Copaiba and ergot sometimes produce itching, and chronic lead poisoning is sometimes accompanied by it. The successful treatment of pruritus obviously rests upon the determination and removal of the causative factor.

PRUS, BOLESLAV. See GLOWACKI, ALEKSANDER.

PRUSA. See BRUSA.

PRUSSIA, prŭsh'ȧ. A kingdom and the largest state of the German Empire. By the Imperial constitution of 1871 the King of Prussia bears the title of German Emperor. The Prussian territory completely or nearly surrounds that of five of the smaller states of the Empire—the grand duchies of Mecklenburg-Schwerin and Mecklenburg-Strelitz, the duchies of Anhalt and Brunswick, and the Grand Duchy of Oldenburg; also the three free towns of Lübeck, Hamburg, and Bremen. With these exceptions the whole of north Germany and its low plain are embraced in the Kingdom of Prussia. A small detached portion of Prussia, Hohenzollern, is in the extreme south of the Empire. Exclusive of Hohenzollern Prussia extends from lat. 49° 7′ to 55° 54′ N. and from long. 5° 52′ to 22° 54′ E. With an area of 134,650 square miles (including Hohenzollern, 441 square miles), it embraces more than three-fifths of the territory of the German Empire. It also has five-eighths of the population of Germany. The density of population was 298.2 to the square mile in 1910.

Topography. Prussia has a frontage of nearly 1100 miles on the North and Baltic seas. The tidal variations of level in the North Sea are not great, but northwest storms have wrought great destruction on the low, flat seaboard of Prussia, so that in the course of centuries a large area of coast has been destroyed by the washing away of the shores. The Frisian Islands, fronting this part of the Prussian coast, are the ruins of a former coast line, and large parts of the present coast are saved from destruction only by costly works of protection. Much of the coast is bordered by marshy land, which affords fine pasturage. The Baltic, still more shallow than the North Sea, also lacks important flood and ebb tides, but instead of marsh formations along this coast sandy and gravelly soils abound. There are fewer islands than along the North Sea, one, however, the island of Rügen, being of considerable size. The coast has several deep indentations, the most important of which are Kiel Bay, Lübeck Bay, Pomeranian Bay, and the Gulf of Danzig. Sand dunes stretching along parts of the coasts have nearly cut off the sea, and the lagoons (*haffs*) within are filled with fresh water from the rivers emptying into them, so that the *haffs* are only slightly brackish. Outside of Hamburg, Bremen, and Lübeck, Prussia has all the important seaports of Germany.

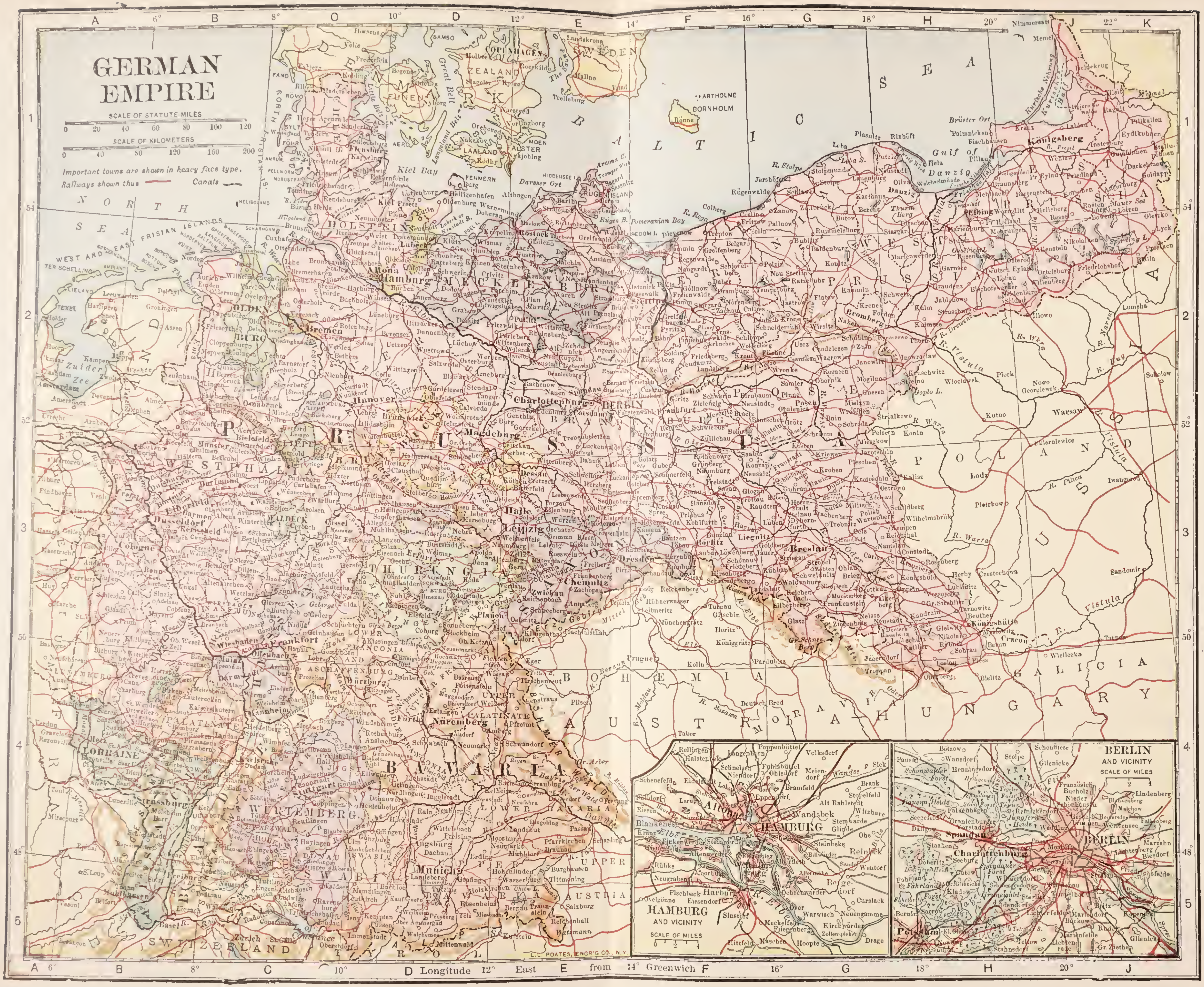
The great plain which comprises by far the larger part of Prussia is by no means flat or level, though its elevations formed of the accumulations of bowlders and ground moraine of the Ice age rarely exceed 600 feet in height. Communications in all directions meet with no obstacles on this comparatively level surface, stretching in Prussia between the river Ems and the Russian frontier and southward nearly to the southern boundary of the Kingdom. (See GERMANY.) In the south-centre (region of the Harz) and the southwest (lower Rhine plateau) the surface rises and merges with the hilly and mountainous regions of the South German states, but in the southeast the great northern plain is continued in the low plain of the Oder and only the boundary of the Kingdom lies in the northern part of the Sudetic ranges.

Hydrography. Prussia has the middle and lower courses of all the great rivers of Germany excepting the Danube. It is within its borders, therefore, that the Rhine, Weser, Elbe, and Oder attain their highest availability for navigation, as they flow over the plain gently sloping to the north and northwest. In the northeast are the Vistula, Pregel, and Memel (Niemen), the first and the last entering the country from Russia. Naturally the canal system of the Empire has its largest development on the plain of Prussia, where these artificial highways may most easily be constructed. (See GERMANY for rivers, canals, and lakes.) All the great rivers of the plain receive their large tributaries from the east, so that their courses are near the western limits of their drainage systems.

Climate and Soil. The distance from the Atlantic is the determining control of the differences of temperature of Prussia rather than distance from the equator. Increasing altitude as one goes south from the coast gives the more southern latitudes the same conditions of temperature as the coast provinces. The temperature differences are greater between the west and the east of Prussia, as the continental influences are intensified towards the east. The Rhine Province has the least and the Baltic lands the greatest extremes of temperature. There is sufficient rainfall for agriculture, the precipitation being quite evenly distributed and averaging 21 inches per annum and being as high as 30 inches or more near the North Sea. (See GERMANY, *Climate.*) The alluvial soils of the Rhine Province are the best in the Kingdom, while the glacial till of the plains to the east is poor in plant food and is made highly productive only by the most scientific methods of fertilization. Sixty-three per cent of the soil is poor or mediocre sandy loam or sand, 6 per cent is bog or marsh, and 29 per cent is good loam or clay. For flora and fauna, see GERMANY.

Geology and Mineral Resources. The whole plain is strewn with sand and clay of Quaternary age that have been spread over the surface by glacial and alluvial action from the Ice age till the present time. These deposits rest upon areas of all formations from the Primary down through the Tertiary, small parts of these harder rocks projecting here and there above the diluvium and alluvium, as, e.g., the chalk cliffs of Rügen and the limestone plateau to the east of Berlin near Rüdersdorf. In the southeast the mountains of Silesia are composed chiefly of granite, gneiss, and schists, while the highlands of the Harz and the lower Rhenish plateau are composed almost entirely of Devonian and Silurian rocks. Prussia ranks among the great mining countries and leads the German states in value of mineral product. Ninety per cent of Germany's coal comes from Prussia, chiefly from Silesia, Westphalia, and the Rhine Province. Lignite is extensively mined in the Province of Saxony. The output of coal in 1912 was 165,302,784 tons (metric) and of lignite 65,803,959 tons. Westphalia, Silesia, Hanover, and Hesse-Nassau are the sources of Prussian iron, the output of pig iron in 1911 amounting to 10,477,263 tons (metric). Upper Silesia is the world's largest source of zinc, and its output in 1912 was 643,598 tons. Copper mining in that year yielded 974,285 tons of ore, and lead ore 142,839 tons. In 1912 the number of persons employed in and about mines in Prussia was 720,230. See GERMANY, *Geology* and *Mining.*

Agriculture. Prussia is the most important agricultural state of the German Empire, containing about two-thirds of the entire cultivable area. About 50 per cent of the total area is arable land. The number of agricultural holdings was 3,400,144 in 1907, while the total farm land was 20,984,025 hectares (hectare = 2.471 acres). The number of holdings under 20 hectares in 1907 was 3,205,051, comprising 40.6 per cent of the total farm land. The percentage of farm holdings of 100 hectares and over (28.1) is larger than that of the Empire (22.2). Large estates are especially



GERMAN EMPIRE

numerous in the eastern provinces, where many of the landed gentry still live on estates of 1000 hectares and upward. In spite of Germany's development, during the last few decades, in manufacturing at the expense, in some degree, of her agricultural interests, the farmers of Prussia are in a fairly prosperous condition, owing to intensive cultivation of the land, the fostering care of every agricultural interest both by Imperial and by royal legislation, and the use of excellent farm machinery. Among the later developments of Prussian agriculture is the association of neighboring farmers for the purpose of buying machinery run by electricity, alcohol, or other artificial motive power for plowing, threshing, grinding grain, and many other purposes. Prussia leads the world in the use of alcohol as steam-producing fuel, the alcohol being produced for the most part from the potato crop.

All the common agricultural products are raised in Prussia. Prussia produced in 1913 about 75 per cent of the entire rye crop of Germany (the chief food of the peasantry and most important cereal in the Empire), in addition to 72 per cent of the potato crop (a large amount of it turned into alcohol for fuel and illumination), 63 per cent of the wheat crop, and 67 per cent of the oats crop. The greater part of Germany's beet crop is grown on the plains of Prussia from the Harz Mountains to Silesia. The vineyards of Prussia in 1913 aggregated 17,216 hectares and yielded 218,264 hectoliters of wine. Fruit culture, including all the fruits of the temperate zone, is highly developed.

The area under the principal crops in 1913 and the yield are shown in the following table:

CROPS	Hectares	Metric tons
Rye	4,935,425	9,345,155
Oats	2,943,255	6,559,911
Wheat	1,166,054	2,942.647
Barley	892,154	2,107,158
Potatoes	2,329,404	39,215,298
Hay	3,222,589	14,001,132

Prussia is the leading German state in the number and quality of live stock. The breeding of horses is extensively carried on in the provinces of East and West Prussia and Hanover; while many cattle are bred along the North Sea and in Saxony, the region of the marshes, drained and otherwise improved, being particularly favorable for cattle raising and the dairy industry. Pomerania is well known for its sheep. In 1912 the domestic animals included 3,193,279 horses, 8262 mules and asses, 11,866,079 cattle, 4,111,929 sheep, 15,475,739 swine, and 2,102,703 goats. A large part of the cavalry horses in the German army come from northeast Prussia, and the Prussian government, through the stud farms which it maintains, about 20 in number, exerts great influence on the scientific breeding of horses.

About 23.7 per cent of the area of Prussia is under forests. Only a little over one-half of the total forest area is in private hands, and private ownership is constantly declining. The remainder is held by the state and local governments, the state controlling about two-thirds of the public area. The largest forests are in Brandenburg, Silesia, and the Rhine Province, while Hohenzollern and Schleswig-Holstein are almost entirely devoid of woods. Nearly one-third of the forest area is under coniferous trees, which predominate in the north. The Prussian government derives more than $20,000,000 a year from its forests.

Manufactures. The textile industries thrive in the Rhine Province, noted for its cotton spinning and weaving and for its woolen and silk products, and in Silesia, known for both its cotton and linen manufactures. Aachen (Aix-la-Chapelle) and its district are a great seat of the woolen manufacture, and Krefeld and Elberfeld are noted centres of the silk industry. Berlin and the Rhine Province and some of the largest cities in other sections of Prussia turn out most of the machinery and metal work. The iron and steel industry is on a vast scale, and is centred chiefly in the coal field of the Ruhr. Large amounts of the pig iron and steel made in that region are sent to shops in various parts of the country for manufacture. The most famous iron and steel works are at Essen. Shipbuilding is a very important and growing industry in Kiel, Danzig, Stettin, and Elbing. Car and wagon works centre largely in the eastern cities of Breslau and Königsberg, besides Cologne, Düsseldorf, and Görlitz. Glass, porcelain, and pottery are produced in the Rhine Province, Silesia, and Saxony; the same is true of paper. The chemical industry is especially important in the Rhine cities and is prominent in Berlin also. See GERMANY, *Manufactures,* and the articles on the provinces and leading cities.

Out of the total number of persons engaged in the manufacturing establishments of Germany in 1907, 6,308,439 were employed in Prussia. They were distributed among the following industries (the figures of 1895 being also given for purposes of comparison).

INDUSTRIES	1895	1907
1. Mining and smelting	458,504	736,406
2. Quarries and potteries	314,258	447,453
3. Metal industry	383,932	573,355
4. Machine and instrument making	329,404	655,830
5. Chemical industry	66,661	105,993
6. Textile industry	441,885	445.452
7. Paper industry	72,250	111,555
8. Leather industry	86,692	111,865
9. Woodworking	322,989	411,970
10. Manufacture of food products (including beverages)	586,353	706,732
11. Clothing industry	710,635	758,000
12. Building trades	596,690	919,684
13. Printing and publishing trades	67,539	109,875
14. Artistic trades	9,503	14,470
15. Manufacture of lighting material—soaps and fat.	35,038	55.964

Transportation and Communication. One of the greatest factors in the industrial development of Prussia has been the excellence of its inland water routes and railroad lines, which supplement instead of rivaling one another. An enormous tonnage is carried on the great rivers, on their canalized tributaries, and on the canals, which connect the rivers, so that the waterways as well as the railroads gridiron Prussia, serving commerce between the east and west as well as between the north and south. Steel lighters of large tonnage and small draft have replaced wooden boats on the canals. The government expends enormous sums in the improvement and maintenance of the waterways. The Kaiser

Wilhelm Canal saves two days of steam travel between Hamburg and the Baltic ports as compared with the old route around Jutland.

The Prussian railway system covers not only the entire territory of the Kingdom, but also that of several minor German states. Since 1897, when the Prussian railway system was combined with that of Hesse, Prussia has effected an entrance into the southern territory of Germany. (See Germany, *Railways.*) As reported for 1912, railway open to traffic amounted to 37,698.2 kilometers, of which 35,139 kilometers were classed as state and 2559.2 as private railway and 37,177.6 as broad gauge and 520.6 as narrow gauge. Government ownership and operation has proved a complete success from a financial and commercial point of view. The government derives nearly one-fourth of its entire revenue from the profits of its railway operation, and is able by the manipulation of freight rates to come to the aid of industries in need of special encouragement.

Prussia is one of the six German states possessing a merchant marine. It ranks third, being exceeded by Hamburg and Bremen. Stettin, the largest Prussian port, is far behind these cities. The Baltic ports are frozen over in winter, but that of Stettin is kept open by ice breakers. It is the nearest port to Berlin. Danzig is a large outlet for the cereals of northeast Prussia. Other important seaports are Königsberg, Memel, and Altona. The merchant marine at the end of 1913 comprised 2329 vessels, of 318,646 tons net, of which steamers numbered 687 of 251,924 tons. In 1912 there were entered at the ports 80,903 vessels, of 12,186,428 tons, and cleared 79,030, of 11,821,772 tons. In shipping Prussia is exceeded only by Hamburg.

Commerce. The commerce of Prussia is facilitated by her central position and by the network of river and canal navigation, which make her territories the connecting medium between several of the great European states and give her a free outlet to the rest of the world. Yearly markets are held in about 2700 towns.

Banking. The banking system of Prussia does not differ from that of the rest of the German Empire. (See Germany, *Banking.*) The Imperial Bank acts as the fiscal agent of the Kingdom. Prussia occupies a commanding position in the banking world of Germany, since Berlin is the most important financial centre of the country. The eleven great corporate banks of Berlin (not including private banks like Bleichröder, etc.) do almost as great a business as the Imperial Bank of Germany, with its 300 branches. The leading bank is the Deutsche Bank, with a capital stock of 150,000,000 marks. Each of the Berlin banks shows a larger capitalization that that of any national bank in the United States and compares very favorably with the banks of France. An important financial institution is the Prussian Maritime Association (Seehandlung), founded by Frederick the Great in the middle of the eighteenth century. It was the chief financial support of the Prussian government for more than a century, until the formation of the German Empire, and was intrusted with the investment of the enormous war contribution exacted from France. It is the prototype of the crédit mobilier institutions which found such favor during the nineteenth century in France and other countries. Its activity may be seen from the fact that with a capital stock of less than 39,000,000 marks it had assets exceeding 520,000,000 marks.

Finances. Prussia has a highly scientific and satisfactory revenue system. Taxation, though somewhat burdensome, is very equitably distributed. Direct taxes bring in nearly 10 per cent of the revenue from all sources. The principal direct tax is the progressive income tax. Persons deriving less than a fixed minimum income are exempt. Another important source of revenue in Prussia is the income obtained from government domains and industrial enterprises, railways, mines, salt works, mills, etc. The chief item of expenditure in the Prussian budget is the so-called working expense in connection with government enterprises. The next item is the contribution to the Imperial funds, which every state is required to make to complete the revenue of the Empire. (See Germany, *Finance.*) Next come the interest on the public debt, which in the fiscal year 1915 amounted to nearly 8½ per cent of the amount of the estimated ordinary expenditure; public instruction and worship, with over 6 per cent; justice; and finance. War expenditure is met directly from Imperial funds. Revenue and expenditure (ordinary and extraordinary) have been reported for fiscal years as follows, in marks:

YEAR	Revenue	Expenditure
1901	2,885,071,665	2,688,595,268
1905	3,268,926,617	3,046,883,134
1910	4,408,102,407	4,392,375,416
1914*	4,595,736,227	4,595,736,227
1915*	4,848,881,995	4,848,881,995

* Budget.

The public debt of Prussia has grown to enormous proportions. In 1867 it was 1,323,000,000 marks; in 1881, 1,995,000,000; in 1891, 5,205,000,000; in 1905, 7,208,953,000; in 1910, 9,421,770,789; in 1914, 10,355,537,145. A great part of the debt, however, has been incurred for productive enterprises, such as railways, mines, and domains, which have furnished their own means of liquidation. The interest on the debt amounted to about 366,345,000 marks in the fiscal year 1914.

Population. The population at several censuses is shown in the table on page 307.

The effect of industrial development on the distribution of the population may be seen in the changed proportion of urban and rural population. In 1890, 51.5 per cent lived in rural communes and 48.5 per cent in communes (towns and cities) of more than 2000 population. In 1900 the rural population comprised but 44.5 per cent of the total and in 1910 38.5 per cent. Berlin, the capital, ranks third (after London and Paris) in population among the cities of Europe. The 14 largest cities after Berlin, each with a population exceeding 200,000, are, in order, Cologne, Breslau, Frankfort-on-the-Main, Düsseldorf, Charlottenburg, Hanover, Essen, Magdeburg, Dortmund, Königsberg, Stettin, Neukölln, Duisburg, Kiel.

For religion, education, charities, see Germany.

For army and navy, see Germany; Navies.

Government. The present constitution of Prussia is a written instrument and one of the products of the revolutionary events of 1848. It was promulgated by the King in 1850 and has since been modified by various royal decrees. It may be amended by the King and the Legislature according to the ordinary processes of legislation, except that the resolution for amendment must be twice passed by the chambers, an interval of three weeks intervening between the two votes.

The executive power is vested in the King, who attains his majority at 18 and whose crown is hereditary according to the principle of agnatic lineal primogenial succession. He is irresponsible and exercises his powers through ministers, who must countersign all his official acts and who thereby assume responsibility for them. Their responsibility, however, is not to the Legislature, but to the King, who appoints and dismisses. They represent the King in the chambers, and may participate in the debates. They do not resign upon an adverse vote, for the cabinet system of government does not exist in Prussia. None of them acts as Prime Minister with authority over the others, although the Minister for Foreign Affairs, as chairman of the Council of Ministers, is called the Minister President. Their responsibility is not collective, although they meet occasionally as a Staatsministerium for the consideration of matters of general concern.

DIVISIONS	Sq. miles	Pop., 1871	Pop., 1890	Pop., 1900	Pop., 1910
East Prussia	14,286.5	1,822,934	1,958,663	1,996,626	2,064,175
West Prussia	9,866.7	1,314,611	1,433,681	1,563,658	1,703,474
Berlin (city)	24.5	826,341	1,578,794	1,888,848	2,071,257
Brandenburg	15,383.1	2,036,888	2,541,783	3,108,554	4,092,616
Pomerania	11,633.7	1,431,633	1,520,889	1,634,832	1,716,921
Posen	11,193.6	1,583,843	1,751,642	1,887,275	2,099,831
Silesia	15,573.4	3,707,167	4,224,458	4,668,857	5,225,962
Saxony	9,755.7	2,103,174	2,580,010	2,832,616	3,089,275
Schleswig-Holstein	7,343.2	1,045,419	1,219,523	1,387,968	1,621,004
Hanover	14,868.5	1,961,437	2,278,361	2,590,939	2,942,436
Westphalia	7,806.8	1,775,175	2,428,661	3,187,777	4,125,096
Hesse-Nassau	6,062.5	1,400,370	1,664,426	1,897,981	2,221,021
Rhine Province	10,424.8	3,579,347	4,710,391	5,759,798	7,121,140
Hohenzollern (ter.)	441.0	65,558	66,085	66,780	71,011
Total	134,663.9	*24,689,252	29,957,367	34,472,509	40,165,219

* Including 35,355 soldiers in France.

The legislative power is vested in the King and a bicameral legislature (*Landtag*), the two chambers having substantial equality of powers in legislation. The House of Peers (*Herrenhaus*) consists of three hereditary groups: (1) adult princes of the royal blood; (2) princes of mediatized houses; (3) territorial nobles; and the following nonhereditary elements: (1) life peers, appointed by the King from among certain wealthy and distinguished persons; (2) eight noblemen, elected by certain Prussian landowners; (3) representatives of the universities, of evangelical bodies, and of certain cities; and (4) an unlimited number of worthies appointed by the King for any term he pleases. The total number of members in 1915 was over 300, of whom about two-thirds were representatives of large landowning classes. The House of Representatives (*Abgeordnetenhaus*) is composed of 443 members, elected for a term of five years by indirect vote. For the purpose of election the country is divided into districts, in each of which usually one member is chosen by the three-class system. Under this plan the voters (all male Prussians at least 25 years of age and qualified to vote in the municipal elections) are divided into three classes according to the amount of taxes they pay; the largest taxpayers, who together pay one-third of the taxes, constituting the first class; the next highest taxpayers, who together pay another third, forming the second class; and the remaining taxpayers forming the third class. Each class of voters then chooses an equal number of electors, who then assemble and choose the representative. Thus the moneyed class have a most decided advantage. One elector is chosen from about 250 of the population, and representatives are distributed on the basis of one for about 75,000 inhabitants. The Parliament is regularly convoked by the King each year in November and in special session at such other times as he may choose. Each chamber is the judge of the elections and qualifications of its own members and has full power over its organization, procedure, and discipline except that the sessions must be public. The budget and revenue bills must originate in the House of Representatives and cannot be amended by the Peers.

The organization, jurisdiction, and procedure of the judicial system, as in all the German states, is regulated by the Imperial Judicature Act of 1877. The territorial competence of the courts and the appointment and compensation of the judges, however, are matters of state regulation. The Prussian constitution requires that the judges shall be appointed by the King for life, and they can be removed, retired, or transferred to other districts only by resolution of the courts themselves. Their position is one of independence as concerns the administration. They are admitted to the judicial service only after the completion of a prescribed course of study and preparatory service and after passing two state examinations. The highest courts in Prussia are the *Oberlandesgerichte*, of which there are 15 in number, the one at Berlin being known as the *Kammergericht*. The next lower grade of courts are the *Landesgerichte*, and at the bottom of the judicial system are the *Amtsgerichte*, or magistrates' courts. For the trial of minor criminal offenses the magistrate associates with himself two laymen called *Schöffen*. For the trial of more serious offenses jury courts (*Schwurgerichte*) are constituted in connection with the *Landesgerichte*. They consist of a bench of 3 judges and 12 jurors, the latter being selected from a list of eligibles prepared before the beginning of each year. The Imperial Court at Leipzig serves as a final court of appeal from the state courts. (For a more detailed account of the judicial system, see GERMANY.) Besides the ordinary courts mentioned above there are a number of special courts (*besondere Gerichte*), which the individual states may or may not establish. Such are the industrial courts, the communal courts, agrarian courts, etc. Moreover, as a result of the so-called separation of justice from administration in Prussia in the early part of the nineteenth century, Prussia has a system of administrative courts charged with the adjudication of administrative controversies. As a result of the legislation of 1875 there are three grades of administrative tribunals, viz., the Superior Administrative Court (*Oberverwaltungsgericht*), the Circle Committee, and the District Committee. The first mentioned is composed of an equal number of judges and trained administrators appointed by the King for life. This court has its seat at Berlin and is a tribunal of great influence.

The present system of local government in Prussia dates back to the year 1807, but has undergone numerous reforms, culminating in the noted *Kreisordnung* of Professor Gneist, which became law in 1872. As a result of this legislation the sphere of local autonomy was extended, a judicial control over the action of the administrative authorities was provided for, with a view of preventing abuses which had become quite frequent, and a large nonprofessional service, for the most part compulsory and unpaid, was introduced into the administration with the view of diminishing the influence of the bureaucracy and at the same time of increasing the political capacity of the people, for whom admission to the civil service was most difficult on account of its highly professional character. A distinctive principle of Prussian administration is the separation of local activities into two classes—those which are regarded as of general concern, such as schools, police, and worship, and those of purely local concern, such as highways, local institutions, etc. For the administration of the first class the state is divided into administrative units, in each of which are to be found central officers under control of the Ministers at Berlin. For purely local administration there are local corporations with their own property and officials.

For the purpose of administration Prussia is divided into 12 provinces, not artificial, but historical units (besides the city of Berlin and the territory of Hohenzollern). These are subdivided into government districts (*Regierungsbezirke*), from 2 to 6 in each, 35 in all. The districts are divided into circles (*Kreise*). Below the circle are the justice-of-the-peace district (*Amtsbezirk*) and the commune (*Gemeinde*). In the province there are two sets of government officials, one central and the other local. The chief central officer is the *Oberpräsident*, a purely professional official, somewhat like the French prefect, appointed by the King. He exercises supervision over the administration of affairs which concern the province as a whole, such as those relating to the police, worship, schools, public health, etc. Associated with the *Oberpräsident* in the administration of matters of central concern in the province is the provincial council (*Provinzialrat*).

The organs for the administration of matters of purely local concern in the province are the Provincial Diet (*Landtag*), the Provincial Committee, and the Director. The *Landtag* is the legislative assembly of the province and is composed of members elected for six years by the Diets of the rural circles and by the municipal councils of the urban circles (cities with over 25,000 inhabitants) within the province. The duties of the *Landtag* relate to the organization and management of provincial institutions, the election of local officers, the voting of appropriations and taxes, and the enactment of by-laws on various subjects. The Provincial Committee is the local executive authority for the province, and its chief duty is the enforcement of the measures of the *Landtag*.

The government district, unlike the province, exists only for the administration of those affairs which are regarded as being of general concern, and it has, therefore, no organs for the administration of purely local matters. In each of these areas is a board consisting exclusively of professional administrators appointed by the King, collectively known as the government (*Regierung*) and having at its head an officer called the government president (*Regierungspräsident*). The duties of the government fall chiefly within the domain of the ministries of the Interior, of Agriculture, of Public Works, of Trade and Commerce, of War, and of Education and Worship, to which the government is responsible. Another organ of the government district is the District Committee (*Bezirksausschuss*), composed of the government president, two professional members appointed by the King for life, and four laymen chosen by the Provincial Committee for six years. The chief function of this predominantly lay authority is to exercise control over the action of the professional government president.

As to the circle (*Kreis*) there is found again, as in the province, the distinction between affairs of general concern and those of purely local interest. The matter is, however, somewhat simplified by intrusting to one set of organs the administration of both spheres, but when they act as central organs they are subject to strict central control. These are the *Landrat*, the Circle Committee (*Kreisausschuss*), and the Circle Diet (*Kreistag*). The *Landrat* is the chief executive authority of the circle and the agent of the central administration. He is a highly trained professional administrator and is appointed by the King. The Circle Committee is composed of the *Landrat* and six nonprofessional members elected by the Circle Diet for six years, and acceptance of the office is compulsory. As a central organ it has supervision over the justices of the peace; as a local organ, over other officers of the circle. The Circle Diet is the representative assembly of the circle and is composed of members elected for six years. They are distributed equally between the urban and the rural circles. The Circle Diet elects the members of the Provincial Diet, votes the provincial taxes, contracts loans, enacts ordinances for the administration of various local affairs, and has power to create certain offices and establish local institutions.

The justice-of-the peace district (*Amtsbezirk*) consists of a group of rural communes with a population of about 1500 inhabitants. The justice (*Amtsmann* or *Amtsvorsteher*) is appointed by the King upon the nomination of the Circle Diet for six years, and the office is compulsory and unpaid. The duties of the justice include the control of the local police and the administration of the poor and health laws. The office is therefore one of the most important in the system.

As to the communes there is a distinction between the rural and the urban. The larger rural communes act through representative councils chosen by taxpayers, while the less populous manage their affairs through mass meetings of the voters. The chief executive officer in the commune is known as the *Schulze* or *Dorfrichter* and is elected for six years by the communal council or mass meeting. Communal affairs include the regulation of pasturage, tillage, schools, churches, etc.

In the government of the cities of Prussia the deliberative organ is the council, chosen for six years by the taxpayers according to the three-class arrangement already described in connection with the Prussian House of Representatives. Its powers comprise the general administration of city affairs. The chief executive authority in the city is vested in either a burgomaster or a board elected by the council. Where the board system prevails the burgomaster serves as chairman of the board. He is a high-salaried official with a tenure of at least 12 years, and occupies a position of great influence. In the large cities the central government may vest the control of the police in distinctively central organs, and this it has done quite generally. The executive board acts both as an organ for local administration and as an organ for central administration, and in the latter capacity it is subject to the supervision of the central government at Berlin.

Ethnology. The inhabitants of modern Prussia are, for the most part, German-speaking descendants of the old Teutonic tribes, mixed more or less with Celts in the west and southwest and with Slavs in the east. There are two important branches to be recognized which differ in customs and speech and possibly in descent. These are the Low Germans and the High Germans, occupying respectively the low-lying plains to the north and the higher regions to the south.

In addition to the German-speaking population there are a large number of Slavs in the eastern part of the Kingdom, a considerable body of Danes in Schleswig, a number of Lithuanians in the northeast, of Frisians in the northwest, and of Dutch in the West, and a few representatives of Celtic peoples (French and Walloons) in the west. Of the Slavs the most important are the Czechs, the Wends, and the Poles. The Czechs are found in Silesia and the Wends in Brandenburg and Silesia. Akin to the Wends, but speaking a Polish dialect, are the Kashoubs, or Kassubs, dwelling in the northwest part of the Province of West Prussia and in Pomerania. These form a small remnant of the old Slavic Pomeranians, who formerly occupied this region but have been largely absorbed in the surrounding Teutonic element. The Poles, some 3,000,000, form the largest body of Slavs in Prussia. They dwell in Posen, Silesia, and East and West Prussia. Related to the Poles are the Mazurians, or Mazurs, who dwell in the southeastern portion of East Prussia and still preserve some of their old customs and habits. The old Prussians, the original inhabitants of Prussia east of the Vistula, who preserved their independence until they were subdued by the Teutonic Knights in the thirteenth century, have died out or been absorbed, and their language is no longer spoken. The Jews number about 400,000, of whom about one-fourth dwell in Berlin.

History. The origins of Prussian history up to 1411 are treated under BRANDENBURG (q.v.). In that year the Emperor Sigismund placed over the Mark of Brandenburg the thrifty Frederick, Burgrave of Nuremberg, who was invested four years later with the hereditary sovereignty of the mark and the accompanying dignities of margrave, prince elector, and Imperial archtreasurer. This Frederick was the head of the house of Hohenzollern (q.v.), and with him began its steady rise to power. He was a capable administrator and brought order out of the existing chaos. The work was continued by his son, Frederick II (1440–70). Frederick was succeeded by his brother, Albert Achilles (1470–86). In the *Dispositio Achillea* of 1473 he ordained that the Franconian margraviates (Bayreuth and Ansbach) should be separated from Brandenburg. There now began those family arrangements by which lesser territories, reserved for younger sons or acquired by marriage, were to revert to the elder line in default of other heirs. Joachim II Hector (1535–71) adopted the reformed religion in 1539, thus bringing himself into sympathy with his people, who in common with all of north Germany were embracing Protestantism. He and his successors, John George (1571–98) and Joachim Frederick (1598–1608), were, however, too cautious to involve Brandenburg in the Reformation struggles. The important event in the reign of John Sigismund (1608–19) was the reversion of the Duchy of East Prussia (the region about Königsberg) to the electoral branch in 1618.

In the early part of the thirteenth century, when hope of further achievements in Syria had declined, the crusading order of the Teutonic Knights (q.v.) turned to the task of conquering and Christianizing by the sword the heathen of the countries on the southern and eastern shores of the Baltic. Remorselessly but with tremendous energy they spread their conquests over Prussia, Pomerania, Courland, Livonia, and Esthonia, establishing towns, colonizing, and enforcing conversion upon the conquered inhabitants. The Prussian nationality was gradually swallowed up in the tide of German colonization, and by the seventeenth century the Old Prussian language was extinct. Power and wealth brought a decline in the vigor of the Teutonic Order, and Poland after its union with Lithuania in the fourteenth century (see POLAND) turned its strength against the Knights, against whom war was waged until in 1466 the Peace of Thorn destroyed the independent sovereignty which the order had erected. West Prussia was annexed to the Polish Kingdom and East Prussia, much reduced, was retained by the Teutonic Knights as a fief of Poland. In 1511 Albert of the Ansbach branch of the Hohenzollern was elected grand master of the Teutonic Order under a pledge to refuse to do homage to Poland. Finding this impracticable and failing to find support from the members of the order who were residing elsewhere, he regarded himself as absolved from his pledge, and with most of the Prussian members became Protestant, secularized the state over which he ruled, and received it from Poland as hereditary Duke of Prussia (1525). By agreement with the elder line, upon the failure of heirs in the line of Duke Albert the Duchy of Prussia in 1618 was added to the domains of the Brandenburg Hohenzollern. In the reign of John Sigismund also the beginnings were made of the dominion of Brandenburg in the region of the Rhine. In 1609 the ducal line of Jülich and Cleves became extinct, and in the succession contest which ensued Brandenburg was one of the claimants. In 1666 Cleves, Mark, and Ravensberg were definitively assigned to her.

During the Thirty Years' War (q.v.) Brandenburg was wasted by the contending armies, although the Elector George William (1619–40) temporized with both sides in a vain endeavor to follow the peaceable and thrifty policy of his predecessors. It was, therefore, a devastated and impoverished country to the sovereignty of which Frederick William I, the Great Elector (1640–88), succeeded. He was the first of the three creators of the greatness of modern Prussia. He saw the necessity of making Brandenburg a military state because of its central and exposed position. He brought a small army into existence, was able to command a hearing in the Westphalian peace negotiations, and secured for Brandenburg by his shrewd diplomacy Farther Pomerania, the sees of Halberstadt, Minden, and Kammin, and the succession to the see of Magdeburg (1648). In 1656 he joined Charles Gustavus of Sweden in his onslaught upon Poland, but in 1657 he changed sides, and for his espousal of the Polish cause he obtained from Poland in the Treaty of Wehlau, in the same year, a renunciation of her suzerainty over the Duchy of Prussia. In 1675, when the Swedes invaded Brandenburg while Frederick William was campaigning against France on the Rhine, he returned, totally defeated them at Fehrbellin, and drove them out of Pomerania. Although Swedish Pomerania had to be given up in 1679, a new power had demonstrated its claim to be heard in the affairs of the Baltic. When Louis XIV revoked the Edict of Nantes (q.v.), Frederick William replied by the Potsdam Decree, which made Brandenburg the hospitable asylum for persecuted Protestants and drew to it thousands of French Huguenots, who made most useful citizens. The Great Elector thus prepared the way, during his long reign, for the next great step in the development of his state under his son, Frederick III (1688–1713). The Margraviate of Brandenburg was a vassal state of the Holy Roman Empire; the Duchy of Prussia had been made an independent sovereignty, but its sovereign, as a duke, occupied an inferior rank. When the Emperor, Leopold I, entered upon the struggle of the Spanish Succession he was anxious to secure the support of the German princes, and he consented, against the advice of some of his shrewdest counselors, to allow his vassal, the Elector of Brandenburg, to erect ducal Prussia, which was outside the Empire, into a kingdom (Nov. 16, 1700). Frederick III of Brandenburg placed the royal crown upon his head at Königsberg on Jan. 18, 1701, and thus became King Frederick I of Prussia. As such he was placed on a level with the other independent sovereigns of Europe, and from this time Brandenburg-Prussia had to be reckoned with as a European power.

The reign of Frederick I, aside from this most important achievement, was uneventful. At his death in 1713 he was succeeded by his son, Frederick William I (1713–40), an eccentric monarch, who practiced the closest economies in administration, established the Prussian bureaucracy on a sound basis, and continued the military development of the country, raising the army to an effective strength of more than 80,000 men, the best-disciplined troops in Europe. By the Treaty of Stockholm (1720) he acquired a great part of Swedish Pomerania, including Stettin. He fought no wars and turned over to his son, Frederick II, the Great (1740–86), an efficient military machine and a well-filled treasury. Hitherto the house of Hohenzollern had been steadily loyal to that of Austria. The inevitable rivalry of Prussia and Austria for supremacy in the Germanic body had not made itself apparent. Frederick William saw it just before his death. Frederick clearly understood it, and thereafter it formed the keynote of Prussian policy. Immediately after his accession Frederick made war upon Austria for the possession of Silesia and secured most of that extensive province. The first 23 years of his reign were occupied in a great measure by wars in which the well-husbanded resources of the country were taxed to the utmost. (See SEVEN YEARS' WAR; SUCCESSION WARS.) The second period was devoted to the restoration of the country, the establishment of its prosperity on a permanent basis by the cultivation of its material resources, and the thorough organization of its government in all departments. The government was a despotism, although a benevolent one, in accordance with the prevailing ideas of the eighteenth century. The rise of Prussia to the rank of a first-rate power, representing as she did the Germanic spirit, stimulated German thought and patriotism and prepared the way for the new Germany. By the first partition of Poland the greater part of West Prussia was added to the Kingdom, thereby filling the gap between Brandenburg and East Prussia. Frederick's nephew and successor, Frederick William II (1786–97), took up arms against revolutionary France, and in the Treaty of Basel (1795) had to give up the Prussian territories west of the Rhine. He shared in the second and third partitions of Poland in 1793 and 1795. See POLAND.

Under Frederick William III (1797–1840) Prussia passed through a period of humiliation and then of reorganization. Napoleon (q.v.) saw in the independent Germanic Kingdom a menace to his plans and aimed to crush out its national life. The attempt of the King to play the old Brandenburg part of a neutral when no power in Europe could be neutral only made the misfortunes of the country greater. In 1806, after the campaign of Jena, Prussia found herself prostrate at the feet of Napoleon. The Treaty of Tilsit (July, 1807) tore away about half of the Kingdom—the territories west of the Elbe and the Polish territories acquired in 1793 and 1795. In this crisis the government, organized in a form fast becoming antiquated, had lost its efficiency and degenerated into a helpless bureaucracy under a vacillating king. Then came a great national awakening. Stein, Hardenberg, and Scharnhorst (qq.v.) came into the government as Ministers and completely reorganized the administration, civil and military, changing Prussia from a mere military monarchy to an armed and organized nation under a monarchical government. In 1809 the last remnants of serfdom, which had been in process of abolition since 1717, were done away with. In 1813, allied with Russia and Austria, Prussia entered upon the War of Liberation, and she was able to take an active and effective part in the campaigns that brought about Napoleon's downfall. In 1815 the Congress of Vienna allowed Prussia (reinstated in most of her old German possessions) only the Province of Posen and the city of Danzig of her share of the second and third partitions of Poland, but in recompense awarded what was of much more value to her as a German state—large territories on the Rhine, half of Saxony, and what was left of Swedish Pomerania. From this time the history of Prussia and that of Germany are inseparable. It became the aim of Prussian statesmanship to unite Germany under Prussian leadership and oust Austria from her presidency of the new confederation. The Zollverein (q.v.), including all Germany except Austria, was a step in this direction; but the inherent jealousies of the German states prevented any further advance.

The years from 1840 to 1861, covering the reign of Frederick William IV (q.v.), formed a critical period for Prussia. All Europe was stirring with the liberal and constitutional agitation which culminated in the revolutions of 1848. The King of Prussia possessed cultivated tastes, but he proved to be a bigoted adherent of the old order of caste and privilege. He granted a legislative assembly in 1847, but the basis of representation was provincial, not popular. The revolutionary movement was severely felt in Prussia, especially in the great student centres. In Berlin serious rioting culminated in a pitched battle between the populace and the troops on March 18–19, 1848, in the course of which more than 200 men fell in the defense of the barricades. The King yielded, promising a democratic constitution, consented to the formation of a national guard, and summoned a Liberal ministry. On May 22 a constituent convention assembled in Berlin, but its character was so radical that the King, taking advantage of the reaction which had already set in at Vienna, transferred the convention from Berlin to Brandenburg, and on December 5 pronounced its dissolution, publishing at the same time a constitution based on semi-democratic principles. The old system of different estates was abandoned and a united bicameral legislature established. (See *Government*, above.) In April, 1849, the King refused the Imperial crown offered him by the Frankfort Parliament, on the ground that it did not proceed from the action of the German princes. (See GERMANY.) Frederick William IV thus destroyed the opportunity of bringing Prussia to the forefront in German affairs. In 1850 he showed, by convoking the Erfurt Parliament to consider anew plans for German unity, that his refusal was but half-hearted. At this time, however, Austria was in a better condition for action, and Schwarzenberg promptly brought about the dissolution of the Erfurt gathering. Prussia was on the verge of war with Austria over the situation in Hesse when the timidity and vacillation of the Prussian government again led to a drawing back, and at Olmütz (Nov. 28–29, 1850) Count Manteuffel met Prince Schwarzenberg, acceded to all of Austria's demands, and for the time being destroyed the prestige which Prussia had enjoyed since the days of Frederick the Great. This vacillation ceased when the Crown Prince William became Regent in 1858. Upon the latter's accession to the throne in 1861 Bismarck was called into his councils and speedily became the dominant personality in the German world. He rejected altogether the temporizing and timid policy of his predecessors and made it evident that the regeneration of Germany must be accomplished through Prussian agency and by a policy of force. In 1864 Prussia and Austria engaged in a joint war with Denmark, which resulted in the liberation of Schleswig-Holstein from Danish rule. The differences between the rival powers relative to the disposition to be made of the duchies gave Bismarck his opportunity to force a war with Austria. (See AUSTRIA-HUNGARY; GERMANY; SCHLESWIG-HOLSTEIN.) The Seven Weeks' War (q.v.) followed, in which Prussia had an ally in Italy. By it Austria was forced out of the Germanic body, and Hanover, Hesse-Cassel, Nassau, and Frankfort were annexed to Prussia, with which Schleswig and Holstein were at the same time incorporated. The North German Confederation was formed under Prussian leadership.

It now remained to bring the states of south Germany into the union. This result was brought about with the same certainty of action that had produced the struggle with Austria. The Franco-German War and the establishment of the German Empire followed. From 1870 the identification of the interests of Prussia with those of Germany is due for the most part to the peculiar organization of the Imperial government, which gives Prussia a controlling voice in the affairs of the Empire. See GERMANY, *Government*.

The system of administration, caste, and militarism tends to establish Prussian methods, to further Prussian interests, and to inculcate Prussian thought throughout the Empire. Thus it was that Prussia's compulsory military system was bequeathed to Germany. With the close of the Franco-German War the Prussian government was brought face to face with serious internal problems which have indirectly affected the policy of the Empire as a whole.

First of all there was the task of Prussianizing the newly acquired territories. In the provinces of Hanover, Hesse-Cassel, Hesse-Nassau, Frankfort, Lauenburg, and the duchies on the Elbe which contain a German population, there was but little opposition to this policy. But when it came to assimilating the Danes of Schleswig-Holstein and the Polish districts in the East, affairs took a more serious turn, and after a half century of efforts the problem still remains unsolved.

In Schleswig-Holstein the Prussian government, by prohibiting the use of the Danish language in the schools, in public meetings, and the like, finally succeeded in forcing the German language and institutions on the people. It was in Prussian Poland that this Prussianizing policy encountered the most powerful opposition. The quarrel with the Roman Catholic church (see KULTURKAMPF) did much to aggravate the hatred of Poles for Prussians; for almost to a man the Poles are Roman Catholics. As early as 1873 the government forbade the use of Polish in the elementary schools, but religious instruction in that language was permitted. Gradually even religious instruction in Polish was curtailed, and finally forbidden. The Prussian government continued the policy of "inner colonization," begun in 1885, the object of which was to substitute a German for a Polish population in Prussian Poland. Large sums were appropriated by the government from time to time to purchase estates owned by Poles and to sell them to German settlers, at the same time preventing Poles from buying the land. This policy, however, proved to be ineffectual, for in the succeeding decade it was apparent that the Polish element was still in predominance in this region. In 1904 the Prussian Minister of Finance ordered all Prussian officials to withdraw their accounts from the Polish banks. The Poles responded by taking out their savings from Prussian and depositing them in Polish banks. In this way every move of Prussia has been met with a corresponding counterstroke by the Poles.

In 1907–08 the Prussian government voted £17,500,000 for the compulsory expropriation of the Polish settlers in Posen and the settlement of the land by Germans. The Polish landowners would have to sell if the government so desired, and at the price fixed by the Land Commission. This expulsion of Poles from the country districts not only caused great hatred among the Poles for the Prussians, but has resulted in their leaving the rural districts for the towns and in the Polonization of trade and industry. In all the large centres of industry in Eastern Prussia there is awakening a successful artisan class, and Poles are already markedly progressing in mercantile and industrial life. Bands of Slav laborers have begun a gradual yet systematic migration to the large industrial centres, the cities in the West. The German population is constantly decreasing in numbers in the country districts, while the Polish immigrants from across the frontier were flocking in such large numbers as to remove still further the possibility of ever very deeply implanting Prussian spirit in this race. A majority of Centre, Poles, and Socialists in the Imperial Reichstag brought up the matter of compulsory expropriation of Polish landowners, and finally passed a vote of censure on the government—the first vote of censure ever passed in the Reichstag. However, this had no effect on the policy of the government, and these measures did not in the least lessen the antagonism of the Poles.

Within the last half of the nineteenth century vast changes have gradually come over the social and economic conditions of the leading world powers, but in none has the change been so rapid nor so complete as in several sections in Prussia. In 1871 all Germany was still largely an agricultural country; a few decades have witnessed the appearance of those stupendous industries which have made Germany, through Prussia, one of the mightiest, wealthiest, and most highly industrialized of the world powers.

Within the last 25 years there has been a *Landflucht*, or general migration of the rural population, depopulating the country and overpopulating the towns. The reasons for this are low wages of the farm laborers, their miserable and unsanitary living conditions, the gradual curtailment of their civic rights, due first to their close dependence on the estate, debarring them from legal redress and forbidding protective combinations of any nature, and secondly to their exploitation by their employers.

In the middle of the nineteenth century the Agrarians were for free trade, because the supply of corn and foodstuffs was in excess of the needs of the population, hence there was no fear of foreign competition. But in the eighties there was a larger importation of foodstuffs from America, and this, together with an increase in population, showed the need of trade from abroad and the insufficient amount of home produce. The price of corn, etc., gradually decreased, the income from the land correspondingly decreased, and the landed proprietors were beginning to fear their own ruin. In 1892–94 Chancellor Von Caprivi concluded commercial treaties with Russia and Austria, providing reciprocally for the reduction of import duties on corn and for certain advantages extended to exports of German manufactures. The agricultural classes began an agitation in protest against these treaties and in 1893 formed a great agricultural league, Bund der Landwirte, which soon grew to amazing proportions and controlled the entire Conservative party. This Conservative Agrarian party gradually gained influence with the government and, beginning with the year 1902, effected the passage of a series of tariff laws which placed heavy duties on imported agricultural produce and exempted agricultural implements from duty.

In the years 1906–13 there were series of agitations by the masses of the people in the towns, representing the Socialist and Liberal parties, directed towards reform in the three-class system of voting. (See *Government.*) The reforms sought were: (1) abolition of the discriminations against the small taxpayer; (2) introduction of secret ballot; (3) replacing of indirect by direct taxes; (4) redistribution of seats, apportioned according to population. In 1906 a bill was passed by the House, but provided for only a very minor change in the redistribution of a few seats. In 1908 the resolution for universal suffrage was rejected by the majority. In both instances there were popular demonstrations in the cities and encounters with police and soldiers, attended by a remarkable strengthening of the Socialists, so that for the first time seven Socialists were elected to the 1909 session. In 1910, to quell the agitation, the government declared its intention of reforming the franchise. But when the nature of the bill was disclosed the opposition and indignation grew stronger. Although the bill, as finally passed by a coalition of Conservative and Catholic parties against the Socialists and approved by the government, did not touch upon the redistribution of seats, direct voting, or the three-class voting system, it merely put into the second class the educated, the professions, and those employed in the public service. This so-called reform did not divert the people, and the Berlin Socialists openly declared their disapproval in the May Day demonstrations. In view of this fact the Chancellor most emphatically defined the opposition of the state to the Socialists, and threatened to dispel any violence by employing all the resources of the state for the restoration of law and order.

In 1912, when the elections to the Imperial Diet gave 110 seats out of the total of 397 to the Socialists, the Socialists in Prussia met with disappointment in securing only six seats in the chamber that year. In the matter of extension of the franchise there were strong debates, and the resentment and opposition of Conservatives were strongly marked when, at their instigation, two Socialist members were arrested for resistance to state authority. But, although popular voice was with the Socialists, the latter were helpless in inaugurating any reform. At the time when the agitation for reform was at its height and the popular unrest seemed to grow too strong for any palliative measures, the outbreak of the Great War of 1914 (see War in Europe) diverted the issue of enfranchisement of the poorer classes. See Bismarck; Frederick III; Germany; Political Parties, *Germany;* Socialism; William I; William II; etc.

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PRUSSIA, East. The northeasternmost province of Prussia, bounded by the Baltic Sea on the northwest, Russian Poland on the east and south, and the Province of West Prussia on the west (Map: Germany, J 1). Area, excluding the Frisches and Kurisches Haff, 14,287 square miles. It forms a part of the southern coast plateau of the Baltic Sea, and its surface, largely flat, is interspersed with marshy tracts in the northeast and south and with dunes along the coast. The southern part is remarkable for its numerous lakes, of which the largest are the Mauer, Spirding, and Löwentin. The chief rivers of the province are the Niemen (here called the Memel), the Pregel, the Passarge, and the Alle. The larger rivers are navigable, and many of the lakes are connected by canals. The climate is harsh. Agriculture is the principal occupation, and rye, oats, barley, wheat, and potatoes are grown. Stock raising is very important, and the horses of East Prussia are among the best in Germany, horse breeding being furthered by several large studs.

The forests belong mostly to the state and are exploited extensively. The manufacturing industries are as yet slightly developed, and most of them are in connection with agriculture, such as brewing, distilling, and the manufacture of beet sugar. Iron is produced in limited quantities, and the manufacturing of textiles is carried on as a house industry. The transportation facilities of the province are very good, there being, besides the extensive system of natural and artificial waterways, 1799 miles of railway, chiefly state lines, in 1912. For administrative purposes East Prussia is divided into the two districts of Königsberg and Gumbinnen, with Königsberg as the capital. The province is represented by 36 members in the Lower House and 24 in the Upper House of the Prussian Landtag and returns 17 deputies to the Reichstag. Pop., 1900, 1,996,626; 1910, 2,064,175. In 1910 the Evangelical population constituted 84.34 per cent of the whole; Roman Catholic, 14.09; other Christian, 0.84; Jewish, 0.63. See Prussia.

PRUSSIA, West. A province of Prussia, bounded by the Baltic Sea on the north, East Prussia on the east, Russian Poland and the Province of Posen on the south, and the provinces of Brandenburg and Pomerania on the west (Map: Germany, H 2). Area, 9867 square miles. The surface is mostly flat and in some parts lies below the level of the sea. It is traversed from west to east by a range of hills which reaches its greatest height in the Turmberg, 1080 feet. The chief indentation on the coast is the Gulf of Danzig, which is separated from the sea by the long spit known as Hela Peninsula. The southwestern part of the Frisches Haff also belongs to West Prussia. The province is watered principally by the Vistula and its tributaries and contains many small lakes. The climate is somewhat raw in the lower parts. Agriculture is the principal industry, and rye, potatoes, and oats are the chief products. Sugar beets and tobacco are produced on a large scale, and stock raising is also well developed, the province being noted for its fine horses. The manufacturing industries are as yet unimportant and are confined entirely to the cities. The principal industries are shipbuilding, notably at Danzig and Elbing, and lumber manufacturing in many of the cities along the Vistula. Linen and other textiles are produced in the rural districts. The chief article of commerce is lumber, which is imported extensively from Russia to Thorn and Danzig. In 1912 there were 1412 miles of railway. For purposes of administration the province is divided into the two districts of Danzig and Marienwerder, with the city of Danzig as the capital. It is represented by 22 members in the Lower House and 13 in the Upper House of the Prussian Landtag and returns 13 members to the Reichstag. Pop., 1900, 1,563,658; 1910, 1,703,474. In 1910 the Roman Catholic population constituted 51.82 per cent of the whole; Evangelical, 46.32; other Christian, 0.99; Jewish, 0.82. See Prussia.

PRUSSIAN CARP. See Gibel.

PRUSSIAN LANGUAGE, Old. See Old Prussian Language.

PRUSSIC (prŭs′ĭk) **ACID.** See Hydrocyanic Acid.

PRUTH, pro͞ot. An important tributary of the lower course of the Danube. It rises in the Carpathian Mountains, on the boundary of Galicia and Hungary, flows through the southeastern part of Galicia, and then forms the boundary line between Bessarabia (Russia) and Rumania, joining the Danube near Galatz (Map: Balkan Peninsula, G 2). Its total length is over 500 miles. Its course is very swift, and the river is used principally for floating timber, although it is navigable from Jassy downward for about 170 miles. The regulation of the river, which might be an important waterway, has been difficult because of its international character. In 1711 the army of Peter the Great was hemmed in on the bank of the Pruth, near Husi, by the Turks. They finally allowed the Czar to withdraw upon his consenting to give up Azov.

PRUTZ, pro͞ots, Hans (1843-). A German historian, born at Jena, son of the following. He studied in Jena and in Berlin, where he established himself as privatdocent in 1873. The results of an expedition into Syria, undertaken by order of the government in 1874, were embodied in the work *Aus Phönicien* (1876). In 1877 he became professor at the University of Königsberg, and after having resigned his chair, owing to a disease of the eye, settled in Munich in 1902. His principal works include: *Heinrich der Löwe* (1865); *Kaiser Friedrich I.* (1871-74); *Kulturgeschichte der Kreuzzüge* (1883); *Staatengeschichte des Abendlandes im Mittelalter* (1885-87); *Entwicklung und Untergang des Tempelherren-Ordens* (1888); *Aus des grossen Kurfürsten letzten Jahren* (1897); *Preussische Geschichte* (1899-1902), in which he placed himself in opposition to the delineation of Prussian history as inspired by patriotic tendencies; *Bismarcks Bildung, ihre Quellen und ihre Aeusserungen* (1904); *Die geistlichen Orden, ihre Stellung zur kirchlich-politischen Geschichte und wirtschaftlichen Entwicklung* (1907).

PRUTZ, Robert Eduard (1816-72). A German poet and historian of literature. He was born at Stettin and studied philology, philosophy, and history in Berlin, Breslau, and Halle. Prutz boldly advocated liberal ideas in science, religion, and politics and incurred the dislike of the government in consequence. In 1849, however, mainly as a result of the popularity of his free lectures, he was appointed professor of literature at the University of Halle and soon had a large following of liberal-minded students, but was so harassed by the government that he resigned in 1859 and retired to his native place, where he devoted himself entirely to literary pursuits. Besides several volumes of poems, notably *Aus der Heimat* (1858), *Aus goldenen Tagen* (1861), *Herbstrosen* (1865), *Stimmen der Liebe* (1868), he wrote a sparkling aristophanic comedy, *Die politische Wochenstube* (1843), which involved him in political difficulties, several other dramas, and the novels *Das Engelchen* (3 vols., 1851), *Der Musikantenturm* (1855), *Oberndorf* (1862), and others. His writings on literary subjects, which are more important, include: *Der Göttinger Dichterbund* (1841); *Geschichte des deutschen Theaters* (1847); *Geschichte des deutschen Journalismus* (1845), incomplete; *Die deutsche Litteratur der Gegenwart* (1859); *Ludwig Holberg, sein Leben und seine Schriften* (1853); translations of Holberg's selected comedies (4 vols., 1868); *Menschen und Bücher, biographische Beiträge zur deutschen Litteratur und Sittengeschichte des 18. Jahrhunderts* (1862). Consult Gottschall, in *Unsere Zeit* (Leipzig, 1872), and the *Allgemeine deutsche Biographie*, vol. xxvi (ib., 1888).

PRYDZ, prụdz, Alvilde (1848-). A Norwegian novelist. She was born near Fredrikshald in southern Norway. In 1880 she gained some attention by the story *Agn og Agnar* (1880). After the publication of *I Moll* (1885) she received a government stipend and traveled in Denmark, Germany, Switzerland, and Italy. Mention should be made of *Undervejs* (1889); *Lykke* (1890); *Mennesker* (1892); *Arnak* (1892); *Dröm* (1893); *Bellis* (1895); *Gunvor Thorsdatter til Hæro* (1896; 6th ed., 1906; Ger. trans., 1897); *Sylvia* (1898); sketches of travel in the form of fiction, *Blade* (1898); *Aino* (1900), a drama; and the novels *Det lovede Land* (1902), *Barnene paa Hæro Gaard* (1906; 3 eds.), *I Ulvedalene* (1909), *Mens det var Sommer* (1911).

PRYMER. See Hours, Book of.

PRYNNE, prĭn, Hester. The heroine of Hawthorne's *Scarlet Letter*, condemned for her sin to wear on her breast the badge which gives the title to the romance.

PRYNNE, William (1600-69). An English political polemist and annalist. He was born near Bath, where he received his early education; he took the degree of B.A. at Oriel College, Oxford, in 1621, subsequently studied law at Lincoln's Inn and was called to the bar in 1628. He early became involved in ecclesiastical controversy and speedily made himself heard as a champion of the Puritan party in various pamphlets directed against Arminianism. In 1633 appeared his *Histrio-Mastix, or a Scourge for Stageplayers*, an attack on the popular amusements of the period, which contained presumedly veiled attacks on the King and especially upon the Queen. He was imprisoned in the Tower, underwent prosecution in the Star Chamber, was sentenced to a fine of £5000, degradation from his degrees, and expulsion from Oxford and Lincoln's Inn, the loss of both his ears in the pillory, and to have his book burnt in public by the hangman. He was also condemned to perpetual imprisonment and was reimprisoned in the Tower. Three years after he found means to publish from his prison another pamphlet, in which he fiercely attacked the hierarchy and was unsparing in his abuse of Laud and other bishops. For this he was again prosecuted, another fine of £5000 was imposed, he was again pilloried, losing such stumps of ears as the executioner had before spared, and was branded on both cheeks with the letters S.L. (seditious libeler) which he ingeniously interpreted as "stigmata Laudis."

He remained a close prisoner till in 1640—the Long Parliament then sitting—he was released by a warrant of the House of Commons and was received in London with loud expressions of popular sympathy. Shortly afterward he went to Parliament as member for Newport, Cornwall, and in 1647 was elected recorder of Bath. For some years he was actively and at times prominently engaged on the popular side in the proceedings of the House of Commons. But he wrote against independency, and in the extreme measures leading to the deposition and death of the King he declined all share; and being one of those whom Cromwell shortly after expelled from the House of Commons, he proceeded to assail him in print with an asperity equal to that with which he had before made war upon the bishops, in return being again subjected to several years' imprisonment. On Cromwell's death he returned to his place in Parliament, zealously interesting himself in the royal cause; after the Restoration the office was bestowed on him of keeper of the records in the Tower. His passion for pamphleteering, however, again involved him in difficulties with the House of Commons, from which, on a charge of seditious libel, he escaped expulsion only by confession of error and recantation. Henceforth he busied himself chiefly as a compiler of matter illustrative of constitutional and parliamentary history. Of his works, which comprise nearly 200 volumes, the most valuable are the *Calendar of Parliamentary Writs* and his *Records*. He died at Lincoln's Inn, Oct. 24, 1669.

PRYOR, prī′or, Roger Atkinson (1828–). An American journalist and lawyer. He was born near Petersburg, Va., graduated at Hampden Sidney College in 1845 and at the University of Virginia in 1848, and studied law. He became editor of the *Southside Democrat* at Petersburg, and in 1854 he was called to Washington to edit the Washington *Union*, the principal organ of the Pierce administration in the capital. In 1855 he was sent to Greece on a special diplomatic mission, and in 1856 he became editor of the Richmond *Enquirer*, one of the most influential papers in the South. In 1857 he established at Richmond a paper called *The South*, in which his advocacy of extreme States-rights views brought him into national prominence. In 1858 he was elected to Congress and was reëlected in 1860. When Virginia seceded he returned South, where he was elected to the Provisional Confederate Congress and the first regular Confederate Congress. Appointed colonel of a Virginia regiment, he participated in the campaigns about Richmond, distinguished himself in the battles of Williamsburg and Sharpsburg, and was brevetted brigadier general, but resigned his commission in 1863 as a result of a quarrel with President Davis. He soon enlisted again as a private in Fitzhugh Lee's cavalry and was captured and confined for some months in Fort Lafayette. Returning South on parole, he advised the South to submit. After the war he settled in New York, where he engaged in newspaper work and studied law. Admitted to the bar, he rose rapidly to a prominent place in his profession, and in 1890 he was appointed by Governor Hill a judge of the Court of Common Pleas, in 1891 was elected to the same office for a 14-year term, and under the provisions of the new constitution of 1894 was transferred as a justice to the reorganized Supreme Court. He retired from the bench on account of age in 1899 and resumed law practice in New York City.

PRYTANES, prĭt′ȧ-nēz. See Epistates.

PRYT′ANE′UM (Lat., from Gk. *πρυτανεῖον*, *prytaneion*, from *πρύτανις*, *prytanis*, Lesbian *πρότανις*, *protanis*, presiding officer, from *πρό*, *pro*, before). A public building in various Greek cities, especially one in ancient Athens, where the state extended the rites of hospitality to foreigners and citizens of distinction. Consult C. H. Weller, *Athens and its Monuments* (New York, 1913).

PRZASNYSZ, pshäs′nĭch. A city in the Government of Plock, Russia, 59 miles northeast of Plock. It has cloth and leather manufactories and is a cattle market. Pop., 1900, 9245. In the European War which began in 1914 this city and its region was the centre of much fighting during the tremendous German campaign against the Russians. The Germans took it by storm in February, 1915, but lost it in March. They recaptured the place in July, 1915. See War in Europe.

PRZEMYŚL, pshĕ′mĭzl, or Peremysl. A fortified town in the Crownland of Galicia, Austria, situated on the San, 54 miles west of Lemberg (Map: Austria, H 2). It is the seat of a Roman Catholic and a Greek Orthodox bishop and has a number of old churches and monasteries, a higher Gymnasium, a seminary for teachers, etc. Its manufactures include machinery, spodium, liqueurs, flour, and naphtha. There is a considerable trade in wood, grain, leather, and linen. During the European War which began in 1914 Przemyśl was completely invested by the Russian forces. After withstanding an heroic siege lasting approximately five months, the Austrians were compelled to capitulate on March 22, 1915. The Russians held the town only until June 2, when they were compelled to evacuate it in the face of a strong Austrian army, supported by a large contingent of German troops. See War in Europe. Pop., 1900, 46,349; 1910, 54,869.

PRZHEVALSKI, pzhȧ-väl′y’-skė, Nikolai Mikhailovitch (1839–88). A Russian explorer, born of Polish parents at Kimbrovo in the Government of Smolensk. He was educated at the Gymnasium of Smolensk, entered the military academy at St. Petersburg, and from 1864 to 1866 lectured on history and geography in the Warsaw Cadet School. In 1867 he volunteered for service in eastern Siberia, where he explored and botanized for two years in the valley of the Ussuri, publishing his *Notes on the Ussuri* on his return to St. Petersburg. This book gave much valuable information on northern Manchuria, and the Russian Geographical Society awarded him a medal for a paper written on the native population of that region. In 1870 he started on his first expedition to Central Asia and traveled for three years in the west-central part of the Chinese Empire. The results of his explorations were published in his *Travels in Mongolia,* which is the standard work on that part of the Empire. In 1876–77 he rediscovered the Lob-nor and traced the course of the great river Tarim, which enters that lake after draining the whole of Chinese Turkestan. He also reached the Altyn-Tagh Range, which forms one of the northern barriers of Tibet. This great journey is recorded in his book *From Kulja across the Tian-Shan to Lob-nor.* In his third expedition (1879–80) he explored the sources of the Hoang-ho and a part of eastern Tibet, and attempted to reach Lhasa from the north, but was unable to proceed farther than the region of the Kuku-nor, where he was deserted by his guide and suffered terrible hardships. His fourth journey (1883–85) extended from Kiakhta to the sources of the Hoang-ho, including the exploration of northern Tibet. He crossed the Gobi waste, discovered the water parting between the upper courses of the Hoang and Yang-tse rivers, and found the wild camel. Another attempt on this journey to reach Lhasa was unsuccessful. He was preparing for another journey into Tibet when he died of typhoid fever on the shores of Lake Issik-kul, at the town of Karakol, which was later renamed Przhevalsk in his honor.

PRZIBRAM. See Pribram.

PRZIBRAM, pshē′bräm, Hans (1874–). An Austrian zoölogist, born at Vienna. He studied in the universities of Vienna (Ph.D.), Leipzig, and Strassburg and after 1903 was privatdocent at Vienna. He wrote extensively on experimental zoölogy, some of the results of this work having been collected in book form under the general title *Experimentale Zoölogie.* Of this series there have appeared *Embryogenese* (1907), *Regeneration* (1909), *Phylogenese* (1910). The first part was published in English translation in 1908 as *Experimental Embryology: 1. Embryogeny.*

PRZYBYSZEWSKI, pshē′bė-shĕf′skė, Stanislaw (1868–). A German-Polish writer of the ultramodern school. He was born at Posnam (Prussian Poland), studied in Germany, and traveled in France, Spain, and the Scandinavian countries. His literary career began in 1892 with his impressive studies *Zur Psychologie des individuums* (consisting of the essays “Chopin and Nietzsche” and “Ola Hannson”). His *Die Todtenmesse* (1895) and *Homo Sapiens* (1895–98; Eng. trans., 1915), sex novels, gained him fame. He wrote other novels; verse, including the prose poems *De Profundis* (1900) and *Androgyne* (1901); and a number of dramas, including *Das grosse Glück* (1902) and the cycle *Tanz der Liebe und des Todtes* (1901–03). His poetry has lyrical excellence, but his novels and dramas lack action.

PSALM, Gradual. See Gradual Psalm.

PSALMANAZAR, săl′mȧ-nā′zẽr, George (1679–1763). An impostor, born probably in Languedoc. He received a good education from the Jesuits, but spent his youth in idly wandering over Europe. When about 20 he began to masquerade as a Japanese convert from Formosa, assumed the name of Psalmanazar, was brought to England, and introduced to the Bishop of London by the chaplain of a regiment whom he had met at Sluys. The Anglican church rejoiced in the rescued heathen and sent him to Oxford to pursue his studies. Psalmanazar published a fabulous geography of Formosa, as well as a Formosan grammar and dialect specially invented by himself, and also an account of the Formosan religion and customs. About 1710, however, he repented of his continued fraud, confessed his guilt, and became truly religious. By acting as editor and compiler he made a comfortable living and retained the esteem which he had gained under false pretenses. In 1764 appeared *Memoirs of . . . Commonly Known by the Name of George Psalmanazar.* These give no hint of his real name or birthplace.

PSALMODY, säm′ō̇-dĭ *or* săl′mō̇-dĭ (ML. *psalmodia,* from Gk. ψαλμῳδία, a singing of psalms, from ψαλμός, *psalmos,* psalm, hymn, song, from ψάλλειν, *psallein,* to play on a stringed instrument + ᾄδειν, *adein,* ἀείδειν, *aeidein,* to sing). In its widest sense the singing of the Psalms of the Bible or other sacred songs in worship; often restricted, however, to the singing of metrical versions of the Psalms to short, simple airs. See Hymnology; Hymn Tunes; Worship.

PSALM OF LIFE, A. A well-known short poem by Henry W. Longfellow, published in the *Knickerbocker Magazine,* October, 1838.

PSALM OF THE STEPS. See Gradual Psalm.

PSALMS (from Gk. ψαλμός, *psalmos,* psalm, hymn, song), Book of. According to the Jewish canon, the first book of the third division of the Old Testament, known as *Kethūbīm* or Hagiographa. The Greek version placed the books of Job, Psalms, and Proverbs in what was supposed to be the chronological order of their composition, under the influence of the tradition ascribing the first to Moses, the second to David, and the third to Solomon; and this order has been followed in the English translation. The Hebrew title of the book is *Tĕhillīm* (songs of praise), the English “psalms” is from the Greek rendering of *Tĕhillīm,* ψαλμοί. The Book of Psalms is properly a collection of hymns which became a manual of the temple service at Jerusalem in the post-exilic period. The collection consists of 150 compositions, divided in the Hebrew Bible like the Pentateuch into five books: (1) Psalms i–xli, (2) xlii–lxxii, (3) lxxiii–lxxxix, (4) xc–cvi, (5) cvii–cl. The date of the final compilation, which, it must be borne in mind, is independent of the question of composition, is by many scholars brought down to the first century B.C.; but long ere this time there existed collections of psalms, and abundant remains of such collections are found in the book which has been preserved to our time.

Some interpreters divide the whole work into three parts: (1) i–xli, (2) xlii–lxxxix, (3) xc–cl. Of these divisions it is only the first, in which all psalms except the first two are ascribed to David (excluding the tenth, which is a continuation of the ninth, and the thirty-third, which the Greek version ascribes also to David), that may be said to constitute a uniform group. The second division has as a distinguishing mark the use of Elohim as the name of God instead of Yahwe, except in lxxxiv–lxxxix. Taking up these Elohim psalms, it is to be observed that they consist of (*a*) psalms ascribed to David and (*b*) psalms ascribed to Levitical circles, viz., to Asaph or to sons of Korah. The Davidic psalms are li–lxxi, placed between a single Asaphite psalm (l) and the main Asaphite collection (lxxiii–lxxxii), while the Korahite collection is represented by xlii–xlix. Psalms lxxxiv–lxxxix appear to be an appendix of a miscellaneous character, attached to the division. The third division includes Books IV and V, which have so many features in common as to give evidence of having once formed a single collection.

Of the three divisions, the first appears to be the oldest, and in the gradual formation of the Psalter we may distinguish the following steps: (1) a Davidic collection, Book I; (2) a second Davidic collection, li–lxxii (lxxii being an addition); (3) a twofold Levitical collection, (*a*) xlii–xlix, (*b*) l, lxxiii–lxxxiii; (4) a combination of the second Davidic with the Levitical collections; (5) a supplement to this collection, lxxxiv–lxxxix; (6) a third collection, xc–cl. The last step consisted in the combination of the three collections, to which the anonymous Psalms i and ii were prefixed; a division into five sections was then made in imitation of the "Books of Moses," each section provided with a doxology at the close. The purpose of the various collections is evident—to bring together religious hymns; the ascription of groups to members of the Levitical guilds may be regarded as sufficient evidence that the collections were to be used in the ritual. But while this may be admitted, it does not follow that all of the hymns included in the collections were composed for the temple ritual, nor do the considerations above set forth touch the core of the problem as to the date of composition of the hymns themselves.

The natural starting point for the investigation of this problem is the headings in the traditional Hebrew text and in the Greek translation. Although we are obliged to pass beyond the data furnished by these headings, they cannot be altogether set aside, even though their late origin admits no doubt. These headings appear to ascribe the authorship of 73 psalms to David; 49 are anonymous; and the remainder are divided among a variety of authors as follows: two are associated with Solomon, one with Moses, 11 with the sons of Korah, 12 with Asaph, one is attributed to Heman, one to Ethan. But the Hebrew preposition which is translated "to" is an ambiguous particle, and it by no means follows that the expression a "Psalm to David" means necessarily a psalm composed by David. It may mean that, but the same preposition would be used to convey the idea that the psalm was a "Davidic" composition, i.e., belonging to a class of compositions called for one reason or another after David. In such an instance as the psalms of "the sons of Korah" it is quite evident that the preposition "to" cannot indicate authorship, since it is highly improbable that an entire family or guild should have composed any particular hymn. The same conclusion follows from the occurrence of several names at the head of a psalm, as, e.g., xxxix and lxii, which have the names David and Jeduthun attached, or cxxxvii, which in the Greek version bears the heading David and Jeremiah; or cxxxviii, which has three names, David, Haggai, and Zechariah, attached to it in the Greek text. The assumption, therefore, is justified that when the headings were first attached to the psalms, it was not done exclusively with the purpose of indicating authorship, but also to specify the character of the collection to which they belong, and indeed this may very well have been the original meaning of the preposition in this connection. To be sure, only in the case of the series of psalms bearing the name "sons of Korah" can we be certain that we actually have a collection by several authors, but it is plausible to assume that there was also a "Davidic" collection designating not a series of hymns written by David, but for some reason called after him. It is natural that a later age which had created for itself a traditional David who differed largely from the historical one (see David) should have seized upon the existence of a Davidic collection as a support for its traditions and converted David into the author of the 73 psalms bearing his name. It should also be noticed that many Psalms, not ascribed to David in the Masoretic text, are assigned to him in the Greek version, and that the Syriac version makes him the author of practically the whole Psalter. Evidently, therefore, there was no fixed tradition; editorial opinion was in a fluctuating state, and no reliance can be placed upon the superscriptions, so far as the authorship of the Psalms is concerned.

We are thrown back upon internal evidence and the careful study of the style and of the religious views reflected as a final means of determining the date of composition of any particular hymn, and if these methods fail the problem must be frankly declared insoluble. In this investigation it is further necessary to distinguish in the case of many of the psalms between older portions and modifications as well as additions introduced at a subsequent period in the process of editing, or for the purpose of adapting them to the religious aspirations of a later age. The analogy of other hymn books in this aspect is particularly significant. But this increases the difficulty of the investigation. In many of the psalms the references to political or social conditions are of so general or vague a character that agreement among scholars as to the period to which a particular psalm belongs is hardly to be expected; nor is the style in all cases so pronounced as to be of service in settling the date of composition.

Accepting the general order in the growth of the Psalter as above outlined, the most important question involved in a more detailed consideration of the composition of individual poems is whether any belong to the preëxilic period. While some critics are disposed to limit the preëxilic psalms to a very small number, others deny the preëxilic origin of all. To the former it seems quite improbable that after the Exile psalm composition should have assumed such tremendous importance without any impulse from an earlier age. The example of Babylonia and Egypt, where hymns and psalms formed part of the ritual from a remote period, would have been sufficient to lead to the production of such compositions among the Hebrews after they had once established a large sanctuary in Jerusalem, and the religious views embodied in some, if not in many, of the psalms are sufficiently restricted to make them fit in with the conceptions held of Yahwe before the destruction of Jerusalem. Whether, however, one may go back as far as the days of David for the beginning of psalm composition is another question. But it should be borne in mind that many lyrics of great power, depth of feeling, variety of expression, and beauty of form are likely to belong to the period of the Judges and the age of David and Solomon. Among them are the Song of Heshbon, Deborah's Song, the Blessing of Jacob, the Blessing of Moses, the Prophecies of Balaam, and the Elegy over Saul and Jonathan. That the Elegy is purely secular does not necessarily show that David and his contemporaries may not have composed and sung religious hymns as well. But there is scarcely any criterion by which a single psalm in the Psalter can with any degree of assurance be ascribed to David. While Delitzsch accepted 44 psalms as Davidic, Ewald reduced the number to 17 and Baethgen admits only three, viz., the first, third, and fourth, and of these he feels certain about only the first. The number of psalms ascribed to the preëxilic period by this critic is above 30. On the other hand, Olshausen, Cheyne, and Duhm deny that there are any Davidic or preëxilic psalms. Coming to the postexilic period and including among these older psalms that have been worked over, the bulk is by some critics placed before the advent of Greek rule in Palestine. The psalms of the Persian period voice the hopes, struggles, and fears of the religious community in Jerusalem, and the frequent use of the first person in those psalms is perhaps not to be interpreted as representing the sentiments of the individual, but rather the community, and in some cases the people of Israel as a whole. The number of psalms that belong to the Greek period or the Maccabæan age cannot be determined with certainty. Olshausen placed the bulk of the Psalter in the Maccabæan age, and Duhm assigns most of the psalms to the Maccabæan and Hasmonæan periods. Cheyne places 25 psalms in this later period. On the other hand the latest commentator of note, Briggs, assigns seven psalms to David, a very large number to preëxilic times, and only a few to the Maccabæan period. The decision of the Biblical Commission of 1910 insists upon the existence of Davidic psalms, laying particular stress on the authorship by David of those psalms that are ascribed to him in the New Testament, but leaves it open for Catholics to believe that many psalms come from later times and that earlier psalms have been modified in course of transmission.

The Psalter forms, with Job, Canticles, Proverbs, Lamentations, certain oracles in the prophetic books, and lyrics inserted in the historical books, a rich treasury of ancient Hebrew poetry. The determining factor in Hebrew rhythm is the accent; its prevailing tendency is the ascending one; the rhythmic unity is the foot consisting of two parts, having a fixed ratio to each other; the thesis cannot be made up of more than three unaccented syllables; a secondary stress is likely to fall upon a long syllable in the thesis; the duration of the arsis is not measured, but the main stress of necessity causes a lengthening; the most current feet are iambics and anapæsts, feet of different nature may follow each other in the same distich and even in the same stichus. There was a quality in Hebrew verse that caused such men as Philo, Josephus, Origen, Eusebius, and Jerome, who had the opportunity of hearing it read and sung, to use in describing it the terms "tetrameter," "pentameter," and "hexameter," as well as the Greek designations of the feet. As it was not the regular recurrence of long and short syllables in a fixed ratio, it must have been the rhythm-producing stress that gave a similar impression. A distich of three beats in each stichus might often have sounded like an hexameter. But the distich does not possess quite the unity of the hexameter line, and the same foot is not uniformly used. Trochees and dactyls apparently do not occur. The preference for the ascending rhythm is not peculiar to Hebrew poetry, but characteristic of Semitic accentuation and somehow dependent upon certain racial or ethnic psychological tendencies. The rhythm of sentiment and thought was called by Lowth "parallelismus membrorum." It is produced by so arranging the material of a distich as to make the second line a repetition in varied form, a supplement, or a reënforcement of the fundamental ideas expressed in the first line. The thought does not move on continuously from line to line, but returns upon itself, varying, strengthening, and amplifying its contents before proceeding on its way. The sentiment does not flow on like a stream, but surges back and forth like the ebb and tide of the sea. This rhythmic movement of the thought is likewise found in Babylonian, Aramaic, and Arabic poetry, and also in the lyrics of ancient Egypt. As a monostich of two, three, or four beats would not suffice for the balancing of two expressions of the same thought, the distich became the rule. The most common type of the strophe in the Psalter is the tetrastich, but strophes of 6, 8, and even 12 lines are indicated by refrains. Assonance, alliteration, and rhyme are also occasionally found.

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PSALTERY, sa̤l′tẽr-ĭ (OF. *psalterie*, from Lat. *psalterium*, from Gk. *ψαλτήριον*, stringed instrument, from *ψάλλειν*, *psallein*, to play on a stringed instrument). A sort of dulcimer (q.v.), played with the fingers instead of with hammers. It is of Greek origin and is related to the Persian *santir* and the Arabic *kanun*. It was a prototype of the pantaleon and so one of the large family out of which the pianoforte ultimately developed. It was especially important in this respect since in the fourteenth century a keyboard mechanism was attached to the horizontal psaltery, and this keyed psaltery became the direct parent of the spinet, harpsichord, and virginal (qq.v.). It was popular in the Middle Ages for its sweetness of tone and purity of intonation. The Hebrew *kinnor* is rendered "psaltery" in the Authorized Version of the Bible wherever it is used, except in a few passages in Isaiah and in Amos, where it is translated "viol."

PSAMMETICHUS, săm-mĕt′ĭ-kŭs (Lat., from Gk. *Ψαμμήτιχος*, Egypt. *Psemtek*). The name of three kings of Egypt of the twenty-sixth or Saitic dynasty.—Psammetichus I (663–609 B.C.), son of Necho, Prince of Memphis and Saïs, succeeded his father in 663 B.C. as a vassal of Asurbanipal, King of Assyria, but a few years later (perhaps about 660) he renounced his allegiance and, subduing the petty rulers who divided the country, made himself master of all Egypt. He strengthened his title to the throne by marrying a daughter of Queen Amenerdas and established his capital at Saïs in the delta. His military success was due to the aid of Greek and Carian mercenaries, furnished, it is said, by Gyges, King of Lydia, and he subsequently introduced considerable numbers of these troops into the Egyptian army. Psammetichus protected the country by establishing strong garrisons on the frontiers and promoted commerce by encouraging foreigners to settle in the delta. His flourishing reign was marked by a very extraordinary renaissance in art.—Psammetichus II (594–588 B.C.) was the son of King Necho and the grandson of Psammetichus I. It was during his reign that the remarkable inscriptions were written by Carian, Greek, and Phœnician mercenaries at Abu Symbel. During his reign much building was done on the temples of Egypt.—Psammetichus III (526–525 B.C.), the last King of this dynasty, was conquered by Cambyses in 525 B.C., and Egypt thus became a Persian province.

PSARA, psä′rȧ, or **IPSARA.** An island in the Ægean Sea belonging to Greece and situated 10 miles west of the north end of Chios (Map: Balkan Peninsula, E 5). Area, 34 square miles. Previous to the Greek War of Independence it had a population of nearly 30,000 and considerable commerce. In 1824 it was captured by the Turks after a stubborn resistance, and thereafter it steadily declined, until in 1914 it had a population of only 4500, chiefly Greeks. It was annexed to the Greek Kingdom as a result of the Balkan War (q.v.) of 1912–13.

PSCHUTT, pshụt. A slang term which came into vogue in Paris about 1880 to designate the highest degree of the fashionable elegance which had been known as *chic* (q.v.).

PSEU′DEPIG′RAPHA. See Apocalyptic Literature; Apocrypha; Joseph, Prayer of.

PSEUDO-CLEMENTINES, sū′dȯ-. See Clementina.

PSEUDODIPTERAL, sū′dȯ-dĭp′tẽr-*a*l (Gk. *ψευδοδίπτερος*, *pseudodipteros*, from *ψευδής*, *pseudēs*, false + *δίπτερος*, *dipteros*, two-winged, dipteral). A term used to designate a form of temple or temple-like structure surrounded by a colonnade the distance of which from the side walls of the cella is equal to two of the front intercolumniations. The pteroma, in other words, has the same width as in a dipteral temple, but is without an intermediate row of columns between the side of the cella and the external peristyle.

PSEU′DO-IS′IDO′RIAN DECRE′TALS, or False Decretals. A collection of decrees purporting to come from early popes and councils and to have been compiled by Isidore Mercator. The author probably meant to assign them to St. Isidore of Seville (q.v.), as whose work they passed in the Middle Ages. Both the real author and his place of abode are unknown. Early Protestant scholars assigned the collection to Rome, but it is certain that it originated in the Frankish Kingdom. Mainz has been suggested, but recent opinion favors either Rheims or Le Mans in Tours, where the historical conditions seem to make the work possible. The date is between 847 and 852, when Hincmar (q.v.) seems to cite the collection. Part of these documents are genuine, part taken from earlier forgeries, and part the forgery of the compiler. His purpose was to free the bishops from the civil power on the one hand and from the metropolitan and provincial synods on the other. He attempted to relieve the confused condition of the time, when the bishops had no civil redress from deposition and oppression, by bringing forward what purported to be ancient Church law. He exalted the papal powers, but his main aim seems to have been the defense of the bishops. This collection continued to be regarded as of unquestioned authority until the fifteenth century, when Cardinal Nicholas of Cusa first expressed doubts of their authenticity. A similar adverse judgment was rendered by scholars of the Reformation and has been confirmed by modern historical criticism. Closely connected with these Decretals are three other collections, also in large part forgeries and designed to exalt the position of the bishops: the *Hispana Gallica Augustodunensis*, a corrupt text of a Spanish collection of canons used by the Pseudo-Isidore and by some thought to be in their present form his work; the collection by "Benedicta Levita," purporting to be from the archives of Mainz and preceding the Pseudo-Isidore; and the *Capitula Angilramni*, 71 brief chapters, mostly concerning bishops, usually added as an appendix to the Pseudo-Isidorian Decretals. The critical edition of this collection is by Hinschius, *Decretales Pseudo-Isidorianæ et Capitula Angilramni* (Leipzig, 1863). There is also a partial English translation in the *Ante-Nicene Fathers*, vol. viii. Consult P. Fournier, *De l'origine des fausses décrétales* (St. Dizier, 1889); Schneider, *Die Lehre der Kirchenrechtsquellen* (Regensburg, 1892).

PSEUDOLEUCÆMIA, sū′dō̇-lū̇-sē′mĭ-ȧ. See Hodgkin's Disease.

PSEUDOLUS, sū′dō̇-lŭs (Lat., the liar). A comedy of Plautus, performed in 191 B.C.

PSEUDOMORPH, sū′dō̇-môrf. See Crystallography.

PSEU′DONEUROP′TERA (Neo-Lat. nom. pl., from Gk. *ψευδής*, *pseudēs*, false + *νεῦρον*, *neuron*, nerve + *πτερόν*, *pteron*, wing). An order of insects including those groups of the older order Neuroptera of Linnæus in which the metamorphoses are incomplete. As an ordinal term it is not now in use. Erichson, who originally founded the group as a suborder, included in it the Termitidæ or white ants, the Psocidæ or book lice, the Ephemeridæ or May flies, and the Libellulidæ or dragon flies (qq.v.). These groups now form the orders Isoptera, Corrodentia, Ephemerida, and Odonata. Sharp retains the term Pseudoneuroptera as a division of the Neuroptera, and includes in it only the families Embiidæ, Termitidæ, and Psocidæ.

PSEU′DONYM (Fr. *pseudonyme*, from Gk. *ψευδώνυμος*, *pseudōnymos*, having a false name, from *ψευδής*, *pseudēs*, false + *ὄνυμα*, *onyma*, *ὄνομα*, *onoma*, name). A name assumed by an author for veiling his identity or for other reasons. A common equivalent is pen name. Nom de plume, an expression often used in English speech and writing, is not employed by the French. For contemporary pseudonyms, consult *Who's Who* (London, annually) and *Who's Who in America* (New York, annually). The standard works are Barbier, *Dictionnaire des ouvrages anonymes* (4 vols., Paris, 1872–79; supplement by Brunet, 1889); Halkett and Laing, *Dictionary of the Anonymous and Pseudonymous Literature of Great Britain* (4 vols., Edinburgh, 1882–88); Cushing and Frey, *Initials and Pseudonyms* (2 vols., New York; 1st series, 1885; 2d series, 1888); L. H. Dawson, *Nicknames and Pseudonyms* (ib., 1908). See Anonymous.

PSEU′DOPERIP′TERAL (Gk. *ψευδής*, *pseudēs*, false + *peripteral*, from Fr. *périptère*, Lat. *peripteros*, Gk. *περίπτερος*, *peripteros*, having a single row of columns). A term used to designate a form of temple (consult *Vitruvius*, iv, 7) or temple-like structure in which the lateral colonnades of a peripteros are replaced by columns engaged in the walls.

PSEUDO-PHILO. See Apocrypha, *Old Testament*.

PSILOM′ELANE (from Gk. *ψιλός*, *psilos*, bare + *μέλας*, *melas*, black). A hydrous manganese manganate that is found massive, has a submetallic lustre, and is dark gray to black in color. Psilomelane is the commonest of the manganese minerals, with the possible exception of pyrolusite.

PSITTACI, sĭt′ȧ-sī (Lat., parrots). The order or suborder of birds to which belong the parrots, parrakeets, love birds, lorikeets, etc. (qq.v.). The Psittaci are easily recognized by the powerful hooked bill, cered at the base, the fleshy tongue, and the zygodactyl feet. The wings and tail are variable. The furculum is weak, defective, or wanting; the lower larynx is peculiarly constructed with three pairs of muscles; aftershafts are present on the feathers; and the pterylosis is remarkably falconiform. Cæcum, gall bladder, and sometimes the oil gland are wanting. The greatest diversity is shown in the arrangement of the carotid arteries and ambiens muscle. The classification of the Psittaci has proved a puzzle, but there are probably at least two well-marked families, Psittacidæ and Trichoglossidæ, with perhaps seven subfamilies.

PSKOV, pskôf. A western government of Russia (Map: Russia, C 3). Area, 17,070 square miles. The south part is somewhat hilly and undulating; the north is low, marshy, and thickly wooded. The chief rivers are the Lovat, which flows into Lake Ilmen; the Velikaya, a tributary of Lake Pskov; and the Düna, which drains the southeast part of the government. Pskov has a large number of lakes, of which Lake Pskov is the largest. The average annual temperature is about 41° F. Although the soil is mostly sandy and far from fertile, agriculture is the chief industry, with rye and oats as the principal crops. On the larger estates, as well as on the farms owned by colonists from the Baltic Provinces, modern agricultural methods are employed and cereals are raised for export. Flax is grown on a large scale for export. Next to agriculture lumbering is the most important industry in this government. The principal manufacturing industries are distilling, milling, and the production of lumber. The annual value of manufactures exceeds $5,000,000. Pop., 1912, 1,390,000. The bulk of the population is composed of Great Russians. Capital, Pskov (q.v.).

PSKOV. The capital of the government of the same name and one of the most ancient cities of Russia, situated at the confluence of the rivers Velikaya and Psková, 171 miles southwest of St. Petersburg (Map: Russia, C 3). The town is divided into four distinct parts: (1) the Kremlin, together with the adjoining Dóvmont fortifications; (2) the town proper, dating from the middle of the fifteenth century and situated between the two rivers above mentioned; (3) the závelitché, that part which lies on the left bank of the river Velikaya and is connected with the main part of Pskov by two bridges; and (4) the zápskové, a quarter situated on the right bank of the river Psková and also connected by a bridge with the principal part of the town. Most of the town is still surrounded by its partly preserved ancient walls. In the old cathedral in the Kremlin, dating from the twelfth century, are the tombs of the princes of Pskov, while the church in the Spaso-Mirozhsky Monastery (twelfth century) contains well-preserved frescoes and mural paintings and a treasury with many precious relics. Noteworthy also are the cathedral of Sts. Peter and Paul with its ancient icons, the churches of the Old Ascension Convent, and the old palaces of the wealthy merchants. The modern town is devoid of special interest. The higher educational institutions of Pskov include two Gymnasia, a Realschule, a corps of cadets, a seminary for teachers, and one for priests. There is a considerable trade and some manufacturing. Pop., 1904, 31,227; 1913, 36,000.

Pskov, ancient Pleskov, was probably founded as early as 965. Threatened by the Lithuanians and the Germans, it was united with the city of Novgorod (q.v.) to form a bishopric in 992. With the growth of its commerce Pskov became more and more independent, and finally began to elect its own princes, who, however, were still considered as representatives of Novgorod. During the Mongolian invasions of Russia Pskov asserted its independence and attained complete independence (1348).

As a republic Pskov did not differ essentially in its internal organization from Novgorod. Commercially it was of the utmost importance, lying on the way between Riga and Novgorod. In the fourteenth century it became a member of the Hanseatic League. The aggressive policy of the princes of Moscow, however, soon put an end to the little republic. In the beginning of the fifteenth century Pskov committed the fatal blunder of appealing to the princes of Moscow in its struggles with Novgorod, thereby giving them an opportunity to interfere in its internal affairs. The internal conflicts between the masses and the upper classes afforded Moscow an additional pretext for interference, and Pskov was soon compelled to accept princes appointed by Moscow. The position of Pskov was further weakened by the fall of Novgorod, and the republic was finally abolished in 1510 by Prince Vasily III, its *vyetche* being suppressed, its leading merchants exiled to Moscow and replaced by settlers from that city. Since then the city has declined, and the only important event in its history is its long siege by the Poles under Stephen Báthory in 1581–82.

PSKOV, LAKE. A lake in Russia. See PEIPUS.

PSORA, sō′rȧ. See ITCH.

PSORALEA, sô-rā′lē-ȧ (Neo-Lat., from Gk. *ψωραλέος*, *psōraleos*, scabby, from *ψώρα*, *psōra*, itch, from *ψᾶν*, *psan*, to rub; so called from the dots sprinkled over the surface). A genus of plants of the family Leguminosæ, mostly natives of warm countries, with blue, purple, or white flowers and palmate or abruptly pinnate leaves. *Psoralea esculenta*, the breadroot of North America, and prairie apple, *pomme blanche* and *pomme de prairie* of the Canadian boatmen, is a perennial herb about a foot high, with a tuberous root, rich in starch and used as food, both boiled and raw. It abounds on the high plains from the Saskatchewan to Texas. *Psoralea hypogæa* and *Psoralea cuspidata* of the same region also have tuberous roots.

PSORIASIS, sô-rī′ȧ-sĭs (Neo-Lat., from Gk. *ψωρίασις*, itch, from *ψωριᾶν*, *psōrian*, to have the itch, from *ψώρα*, *psōra*, itch). A chronic skin disease characterized by inflammatory, dry, red, roundish patches covered with adherent silvery scales. It is distributed principally over the extensor sides of the extremities, especially about the elbows and knees, and the scalp, as also the trunk, but no part of the body is exempt. The disease is one of adult life, but may occur at any age. Its cause is still obscure. The treatment consists of the internal use of arsenic, iodide of potassium, thyroid extract, salicylates, quinine, and citrate of potash, together with the local use of alkaline baths, zinc oxide, mercurial ointments, thymol, beta naphthol, chrysarobin, etc. Sea-water injections and vaccine therapy have been used of late, but with questionable results. See LEPRA.

PSOVIE, psō′vĭ, or BIRZON, bĭr′zôn. See GREYHOUND.

PSYCHANALYSIS, sīk′ȧ-năl′ĭ-sĭs. See PSYCHOANALYSIS; PSYCHOTHERAPY.

PSYCHE, sī′kē (Lat., from Gk. *ψυχή*, breath, life, soul, butterfly, from *ψύχειν*, *psychein*, to breathe). As a mythological character Psyche is a creation of the later Greek speculation and in literature is scarcely known before the story of Cupid and Psyche in the *Metamorphoses* of Apuleius (q.v.). Here Psyche appears as the youngest and most beautiful of three daughters of a king. She aroused the jealousy of Venus, who sent Cupid to inspire her with passion for the meanest of men. The god, however, loved her on sight, and caused her removal to a fairy palace, where he visited her in darkness, strictly forbidding her to see his face. Her jealous sisters persuaded her to disobey this injunction, but, when she approached the sleeping god with a lighted lamp, his unexpected beauty caused her to start, a drop of oil fell on the god, who woke and, after rebuking her curiosity, disappeared. Vainly Psyche sought him throughout the earth and finally came to the palace of Venus, who treated her as a slave and laid upon her tasks which she deemed impossible, but these the unseen aid of her lover enabled Psyche to accomplish. Finally even Venus's wrath was appeased, Jove gave her immortality, and she was united to Cupid. In this form a common folk tale has been adapted to the philosophy which taught the preëxistence of the soul in happiness, its hard service in the body, and its final immortality in bliss. Though there is no other literary testimony to this myth, the works of art show that as early as the second century B.C. the love of Eros and Psyche had engaged the Greek artists. One aspect of this story is found only on works of art of the Roman Imperial period—the torture of Psyche by Eros. Sometimes we see him holding the butterfly over a torch; at other times he binds and scourges the maiden Psyche, or with a torch singes the butterfly's wings which spring from her shoulders; again, Psyche lies prostrate before him in entreaty. The earlier groups show the lovers embracing. In the Pompeian wall paintings or on gems we also find Psyche or Psyches with Erotes engaged in various human occupations or amusements, especially in the famous Cupid frescoes in the House of the Vettii. On the Roman sarcophagi of the second and third centuries of our era the myth of Psyche is used with obvious reference to the life of the soul, and naturally the representations pass over into the early Christian symbolism. (See CUPID; CUPID AND PSYCHE.) The Psyche myth is the theme of decorations in the famous Villa Farnesina in Rome; these were designed by Raphael and executed by Giulio Romano and others.

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PSYCHIATRY, sī-kī′ȧ-trĭ (from Gk. *ψυχή, psychē*, breath, life, soul + *ἰατρεία, iatreia*, healing, from *ἰατρεύειν, iatreuein*, to heal, from *ἰατρός, iatros*, physician). The science that treats of the pathology, clinical conditions, progress, cause, and treatment of disease affecting the mind, whether it be as mild as a psychasthenia or as grave as an insanity. Whether diseases are within the domain of neurology or that of psychiatry is determined by a study of the symptoms and physical signs in the light of family and personal history. Many diseases affecting the mind present marked physical changes, such as tremors, alteration in tendon reflexes, pupillary anomalies, etc., as well as perversions of conduct or of action, such as exaltation, prodigality, suspicion, abulia, etc. See INSANITY; PSYCHOANALYSIS; PSYCHOTHERAPY.

PSY′CHICAL RESEARCH (from *psychic*, from Gk. *ψυχικός, psychikos*, relating to the soul or mind, from *ψυχή, psychē*, breath, life, soul). The term "psychical research" takes its meaning from the activities of the Society for Psychical Research (q.v.). The original programme of the society proposed a systematic investigation of "that large group of debatable phenomena designated by such terms as mesmeric, psychical, and spiritualistic." The work of investigation of these residual phenomena was intrusted to six committees, who were to inquire severally into "the nature and extent of any influence which may be exerted by one mind upon another apart from any generally recognized mode of perception"; into hypnotism, the so-called mesmeric trance, clairvoyance, and other allied phenomena; to investigate the reports of apparitions at the moment of death and of houses reputed to be haunted; to inquire into the causes and general laws of the phenomena of spiritualism; and to collect material relative to the history of these subjects. The group of inquiries thus circumscribed does not constitute a subdivision of an established body of knowledge, but contemplates an extension or revised interpretation of certain physical and psychical phenomena.

The most extensive investigations of psychical research have sought to establish or detect evidence for the transference of thought apart from the recognized channels of sense. The experimental evidence has been obtained by arranging that one person, called the agent, shall think intently of a definite mental (usually a visual) impression and shall attempt to transfer this impression to the mind of the percipient, who is supposed to be endowed with peculiar powers and who tries to read and record the impression transferred. Numbers, words, drawings of simple geometrical forms, sketches of familiar objects, colors, actions, simple calculations, or even sounds, tastes, and odors have been transferred in this way. The process of transference seems to be most effective when the percipient is in an hypnotic or trancelike condition. In such a state there is an increased sensitiveness to slight indications of sense (hyperæsthesia), which in turn suggests the functioning of an unusual degree of sensibility of the ordinary kind in cases of successful percipiency. The data needed to justify the assumption of a nonsensory mode of thought transference are difficult to collect: first, because the extreme delicacy of sensibility in a sensitive nervous system is itself responsible for much that passes for thought transference; secondly, because the precautions necessary to eliminate such possibilities have not as a rule been taken in the seemingly successful experiments, and proper conditions are often difficult to secure; thirdly, because the usual methods of performing such experiments leave the way open for unconscious exaggeration and misinterpretation, as well as for unconscious indication to the percipient. Recent experimenters have been alive to these difficulties. Yet, in the opinion of many whose judgment is entitled to great weight, the evidence does not yet justify, even provisionally, the entertainment of a telepathic hypothesis.

The telepathic hypothesis does not, however, rest its case upon experimental evidence alone. It presents an enormously extensive body of witnesses to the telepathic sending of hallucinations or presentiments, many of them having direct personal significance to those concerned, and an unusual number of them being connected with the moment of death or danger to one of the persons involved in the hallucination. The proportion of the recorded cases that contain a verifiable coincidence of event and presentiment is, on the whole, small. An elaborate census of hallucinations has been gathered by the society, and sets forth the relatively large occurrence of such hallucinations among normal persons in apparent good health. The doubtfulness of critics is increased by the consideration that an intense interest in presentiments may induce the habit of noticing and recording them, thus increasing their relative frequency and the opportunity for apparently unexplainable coincidence; further by the dominant tendency to note and be impressed by favorable instances and not to notice the vastly larger number of unfavorable ones. Other investigations of students in psychical research relate to asserted interest manifested by spirits of the departed in the affairs of this earth, mainly through individuals known as mediums. Here again the evidence falls into an experimental and an observational group. The experimental evidence is that of the physical phenomena of spiritualism, the moving of tables, appearance of forms, release of the medium from knots and bonds, reading of sealed messages, and so on. In this field so much fraud or sleight of hand has been discovered that the students in psychical research have as a rule recognized the weakness of such evidence. Yet some of the most eminent among them have been unwilling to consider the hypotheses of deception, conscious or unconscious, in certain instances, because of their personal faith in the honesty of the medium; and in such cases as that of Mrs. Piper, in which the subject in a trance state reveals to sitters knowledge of their private affairs apparently quite beyond the usual channels of information, the alternative is presented by the investigators that the information thus revealed is obtained by the coöperation of departed spirits or is suggestive of the action of some such unknown force as telepathy.

In many respects the field of psychical research and of psychology is the same, though the methods and purpose of the investigators may be distinct. Hypnotism, unconscious nervous activity, alterations of personality, hysteria, mental automatisms, and related topics belong to both spheres. A type of such inquiry is crystal gazing, i.e., the alleged power to see in a crystal or other reflecting surface a visual projection of shifting scenes and images, which upon examination can be referred to experiences subconsciously assimilated. As illustrations of the exercise of the subconscious imagination, the record of such instances possesses a distinct value for psychology. To some observers they, like other experiences, suggest the working of supernormal mental processes. Equally deserving of mention are certain studies, pursued by persons interested in psychical research, that contribute to the psychology of deception. Such studies have shown how readily the reports of performances purporting to give evidence of supernormal powers are vitiated by defects of observation, by prejudice, by lack of technical knowledge, by lapses of memory, and the like.

Bibliography. The most important publications are those of the British Society for Psychical Research. The first American Society for Psychical Research (1884–90) published four volumes, then became a branch of the British Society, but after 1906 was again separate. Consult its *Proceedings.* Consult also: Frank Podmore, *Apparitions and Thought Transference* (London, 1894); Andrew Lang, *Cock Lane and Common Sense* (ib., 1894); R. O. Mason, *Telepathy and the Subliminal Self* (ib., 1897); Frank Podmore, *Studies in Psychical Research* (New York, 1897); id., *Modern Spiritualism* (2 vols., ib., 1902); T. J. Hudson, *Law of Psychic Phenomena* (Chicago, 1902); J. Maxwell, *Metaphysical Phenomena* (New York, 1905); J. H. Hyslop, *Science of a Future Life* (Boston, 1905); id., *Enigmas of Psychical Research* (N. Y., 1906); id., *Borderland of Psychical Research* (ib., 1906); Joseph Jastrow, *The Subconscious* (Boston, 1906); Sir Oliver Lodge, *The Survival of Man* (New York, 1909); W. F. Barrett, *Psychical Research,* in Home University Library (ib., 1911); J. H. Hyslop, *Psychical Research and Survival* (ib., 1913); Hereward Carrington, *Problems of Psychical Research* (ib., 1914); Henry Holt, *On the Cosmic Relations* (2 vols., ib., 1915); L. C. Graves, *Natural Order of Spirit* (Boston, 1915). D. P. Abbott, *Behind the Scenes with the Mediums* (Chicago, 1909), describes the methods used for deception. An illuminating case of supposed mind reading in an animal is recorded by Pfüngst, *Clever Hans, the Horse of Mr. Von Osten: A Contribution to Experimental Animal and Human Psychology,* translated by C. L. Rahn (New York, 1911). In Joseph Jastrow, *Fact and Fable in Psychology* (Boston, 1900), will be found a critical survey of certain problems and positions of psychical research.

PSYCHICAL RESEARCH, Societies (British and American) for. The British society was formed in London in 1882, as the result of a conference convoked by Prof. W. F. Barrett, for the purpose of making "an organized and systematic attempt to investigate that large group of debatable phenomena designated by such terms as mesmeric, psychical, and spiritualistic." Through the agency of committees the society has gathered and published a vast amount of material on the subjects involved, with many discussions thereon. (For a discussion of the results attained by the committees, see Psychical Research.) Among the most notable investigations of the society have been those conducted by Richard Hodgson, J. H. Hyslop, and others on the trance medium, Mrs. Leonora Piper, of Boston, Mass. The society's most conspicuous work was the census of hallucinations, which it carried on from April, 1889, to May, 1892, and which led its committee to announce one important deduction: that between the death of a person and the simultaneous apparition of that person to another person, at a distant spot, there is some connection (consult *Proceedings*). The first president of the society was Henry Sidgwick, who served in 1882–84 and also in 1888–92. Other prominent members have been A. J. Balfour, W. F. Barrett, J. R. Holland, R. H. Hutton, the Rev. W. Stainton Moses, Roden Noel, Balfour Stewart, Hensleigh Wedgewood, William James, Sir William Crookes, F. W. H. Myers, Sir Oliver Lodge, Edmund Gurney, Lord Rayleigh, Frank Podmore, Sir J. J. Thomson, Henri Bergson, and F. C. S. Schiller.

An American Society for Psychical Research was formed in 1884, in 1890–1906 was a branch of the British association, and thereafter was again separate. It publishes *Proceedings* (which consult) and also a monthly *Journal.* Consult also the New International Year Book articles on the subject.

PSYCHIC EPILEPSY. See Epilepsy.

PSY'CHOANAL'YSIS (Neo-Lat., from Gk. ψυχή, *psychē,* breath, life, soul + ἀνάλυσις, *analysis,* a releasing, dissolution). The name originally given by Prof. Sigmund Freud, of Vienna, to a system of psychotherapy which he devised and developed. It is a method of psychological investigation designed for the purpose of discovering and exploring the unconscious psychic forces which are at the bases of normal and abnormal psychic manifestations. Psychoanalysis was originally designed for the cure of those border-line cases of mental diseases which are known as hysteria, neurasthenia, compulsion neurosis, etc. It assumes that there are definite reasons for all normal and abnormal mental activities, that no psychoneurotic symptoms are accidental or meaningless, but that they have always unconscious underlying causes which, if found and brought to the surface, become dissipated and cause the symptoms to disappear. With this assumption Professor Freud evolved his theory of repression, which is the main pillar upon which rests the edifice of psychoanalysis. In brief this theory states that the psychoneurotic symptom depends on past emotional experiences of a painful or disagreeable nature which were forgotten or repressed into a mental field called the unconscious.

When an effort is made to trace back the morbid symptoms of a neurotic to their life history, one meets with a resistance which opposes the analytic work by causing a failure of memory. The success of overcoming this resistance depends on the relation existing between the patient and the physician. This relation, or the transference as it is called, consists in the fact that during the treatment the patient continually applies to the physician tender and hostile emotions that have no foundation in the actual relation, but are derived from the patient's old unconscious wish fancies. These two facts, resistance and transference, must be recognized and taken as starting points in every Freudian psychoanalysis.

The aim of psychoanalysis is to bring back into the field of conscious memory all the repressed unbearable ideas, to show the patient the connection between them and the symptoms, thus removing the latter. Because the patients' dreams invariably refer to the symptoms, Professor Freud has developed in his book *The Interpretation of Dreams* a most comprehensive dream psychology. He assumes that dreams are not foolish, that they are perfect psychic mechanisms, that they concern themselves with the most intimate part of the human psyche, and that they always represent, in a distorted form, the realization of a repressed wish. In analyzing dreams or psychoneurotic symptoms use is made of the method of free association. The patient, having focused his attention on a particular part of a dream or symptom, lets his mind drift and repeats to the physician every thought or memory picture that presents itself to his consciousness. The latter thus discovers the meaning of the dream or symptom and imparts the same to the patient.

As it was found that the associations thus produced were mostly made up of erotic material, Professor Freud formulated his theories on sex, and in his *Three Contributions to the Sexual Theory* he asserts that "in a normal sexual life no neurosis is possible." The term "sex," however, is used by him in the broad sense of love and is not limited to the gross sexual.

Besides occupying itself with morbid mental manifestations, psychoanalysis also invades other fields of research. Professor Freud's books, *Psychopathology of Everyday Life, Wit and Its Relation to the Unconscious, Totem and Taboo,* and the *Selected Papers on Hysteria,* throw new light on the problems of æsthetics, mythology, folklore, and on the origins of social customs and religious and moral ideas.

While psychoanalysis, in the hands of competent men, has undoubtedly been of great help in exploring subconscious states, some "wild" psychoanalysts have so thoroughly misinterpreted the sexual question that it endangers the science. In the United States A. A. Brill, J. J. Putnam, T. Burrow, S. E. Jelliffe, and W. A. White have been the foremost representatives of scientific psychoanalysis. For general discussion, see PSYCHOTHERAPY; see also DREAMING; FREUD, SIGMUND; HYSTERIA. Consult: I. H. Coriat, *Abnormal Psychology* (New York, 1914); Sigmund Freud, *Psychopathology of Everyday Life* (Eng. trans., ib., 1914); A. A. Brill, *Psychoanalysis: Its Theories and Practical Application* (2d ed., Philadelphia, 1914), presenting the practical application of Freud's theories.

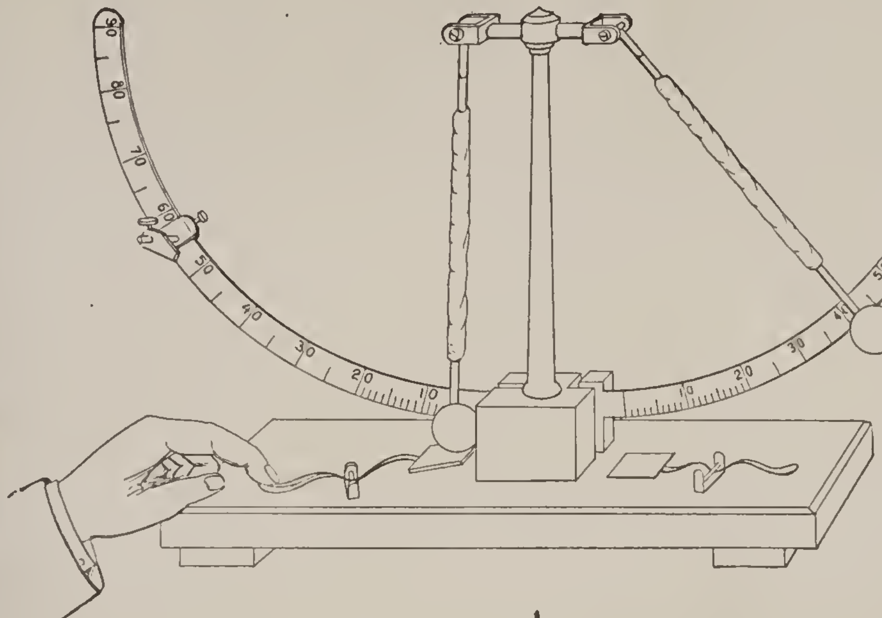
PSYCHOGRAPHY, sī-kŏg′rȧ-fĭ. See INDIVIDUAL PSYCHOLOGY.

PSY′CHOLOG′ICAL APPARATUS. The apparatus employed in a well-equipped psychological laboratory falls into the following main divisions: (1) physiological models of the sense organs and the brain; (2) demonstration apparatus, for use in the lecture room before a large audience; (3) drill apparatus, for class work with students in the laboratory; and (4) research apparatus for the investigation of new problems, generally built, in part at least, within the laboratory. To these four classes may be added (5) certain anthropometrical instruments (see ANTHROPOMETRY), such as those which measure the diameter of the pupil, or the force and steadiness of muscular action; (6) apparatus for the observation of the habits and faculties of the lower animals, such as a microscope, with special attachments for work on the protozoa; mazes of wire or wood, to test the formation of habits in reptiles or small mammals; aquaria; cages whose fastenings are designed to test the intelligence of their occupants; and (7) simple instruments for use with children or defective persons, designed to test sensation, perception, feeling, action, attention.

Psychological instruments proper, i.e., the pieces included in classes (2), (3), and (4), have two purposes: first, to *produce* the physical stimuli which are correlates of definite mental processes, and, secondly, to *measure* and to *record* these stimulations and the physical processes, such as organic movements, which accompany or follow them. We distinguish two classes of such instruments, the qualitative and the quantitative. The former serve primarily to demonstrate a fact, the occurrence of a given mental process under such and such conditions. Quantitative instruments generally permit us to vary stimulation within wider limits, to control it more exactly, and to express it numerically in conventional units. As an instance of an instrument belonging to the first group, we may take the simple afterimage apparatus. It consists of a light placed within a black box, one of whose sides is a plate of ground glass. Behind the ground glass are a wooden shutter and a slide of colored glass. If the shutter is raised for (let us say) 30 seconds and then allowed to fall, an even patch of color is presented to the observer's eye and then replaced by a gray background on which the afterimage appears. If glasses of various colors are employed, the general law of complementary colors in the negative afterimage may be demonstrated. When, however, we wish to investigate the exact dependence of the afterimage upon wave length, intensity, extent, or duration of the inducing color, our problem becomes quantitative and this instrument is inadequate. We resort, therefore, to such instruments as the spectrophotometer, the tachistoscope, the chronoscope, which enable us to control these factors and to express them in exact numerical terms. If, instead, we desire to record the course of the fading image and the number of its recurrences, or if we are interested in its affective and organic accompaniments, we use the graphic method (described later in this article), whereby the changes may be continuously recorded in the form of a curve whose abscissæ are time units and whose ordinates represent the corresponding variations in the process under observation.

Psychological Acoustics. The least perceptible intensity of auditory sensation is determined by means of the *acoumeter.* In one form a tiny hammer drops upon a steel bar from a constant height and the distance of the instrument from the ear is varied; in others a ball of pitch or cork or metal falls upon a glass plate and the height of fall is varied until a point is reached where a sound can just be sensed. The discrimination of sound intensities is measured by the gravity *phonometer,* which is practically an enlarged acoumeter of the second type, or by the *sound pendulum,* in which the ball swings through an arc before striking the block instead of falling vertically upon it.

PSYCHOLOGICAL APPARATUS



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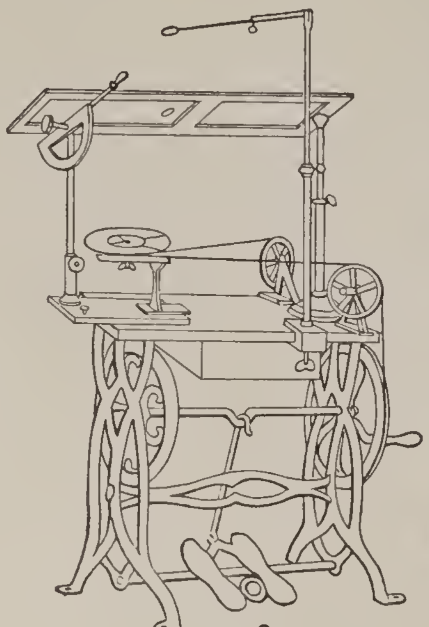

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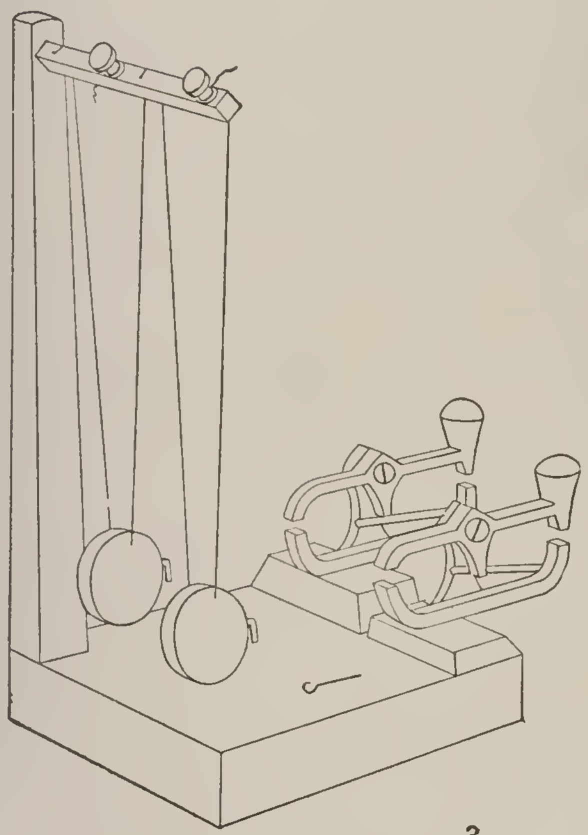

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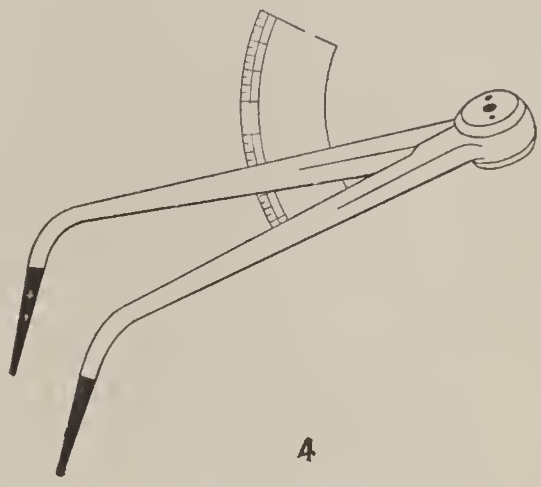

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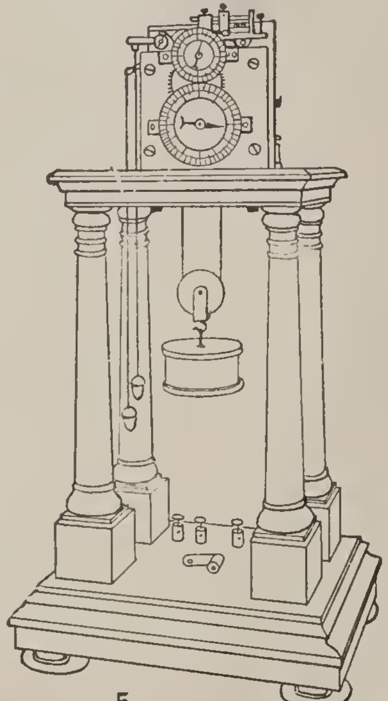

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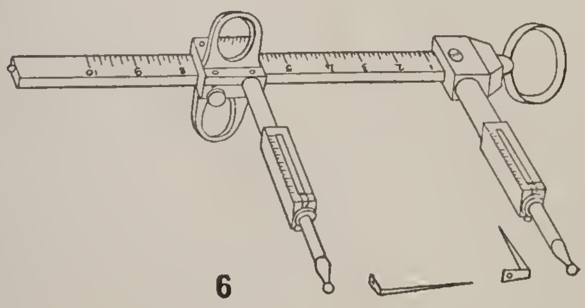

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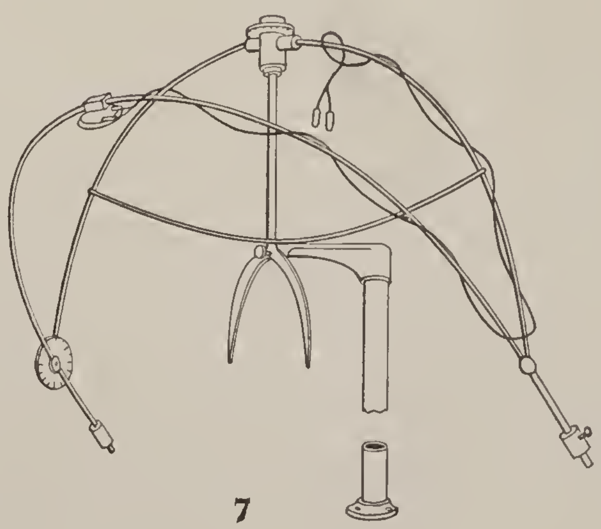

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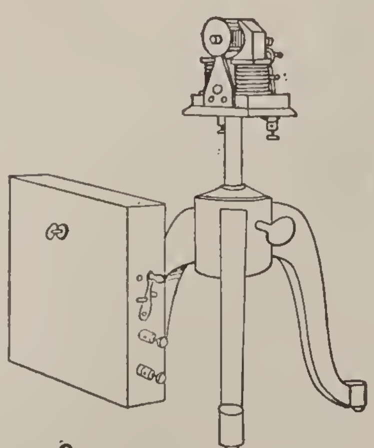
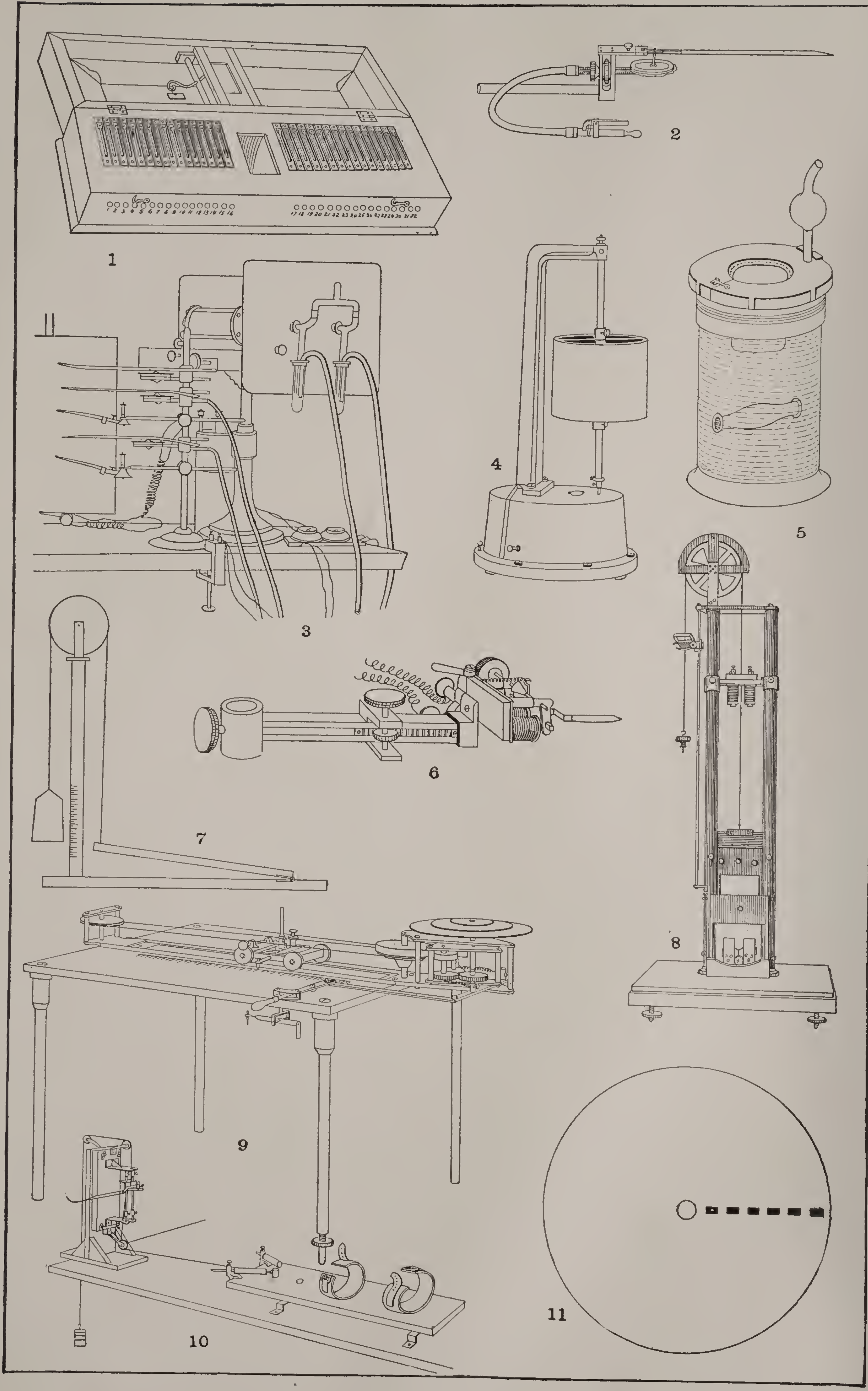


8

1. SOUND PENDULUM
2. COLOR MIXER AND CAMPIMETER
3. VERNIER CHRONOSCOPE
4. SIMPLE AESTHESIOMETER
5. HIPP CHRONOSCOPE
6. GRIESBACH'S AESTHESIOMETER
7. SOUND CAGE
8. ELECTRIC MOTORS FOR COLOR MIXING.

PSYCHOLOGICAL APPARATUS



1. TONOMETER
2. MAREY TAMBOUR, WRITING LEVER AND AIR-COCK
3. ZWAARDEMAKER'S OLFACTOMETER
4. SIMPLE CLOCK-WORK KYMOGRAPH
5. FRANÇOIS-FRANCK'S PLETHYSMOGRAPH
6. DEPREZ SIGNAL
7. ARM BOARD
8. DATTELL-WUNDT TACHISTOSCOPE
9. KINESIMETER OF HALL AND DONALDSON
10. MOSSO'S ERGOGRAPH
11. MASSON'S DISC

Approximately pure tones can be obtained from tuning forks mounted on resonance boxes, or from bottles across the mouth of which a stream of air is forced. *Stern's variators* are blown bottles whose bottoms are pistons which can be raised or lowered gradually and steadily by a system of cogs and a spiral disk. They make possible the production of a comparatively pure tone whose pitch can be quickly and continuously changed. Gasometers or pressure blowers, which furnish a steady current of air, are necessary in connection with blown bottles, since here pitch is partly dependent upon intensity of pressure. Absolutely pure tones are obtained by passing such sounds through *interference tubes* and thus eliminating overtones. The highest audible tone is determined by means of a series of tiny forks or steel cylinders or by the use of the *Galton whistle*, a piston whistle of small bore, whose length can be varied gradually from that which sounds a clear tone to that which gives the impression merely of continuous noise. The lowest audible tone may be found by use of a giant fork with riders, by tuning forks of wire weighted at the tips of the tines, by *Appunn's lamella*, a disk at the end of a steel blade whose pitch is altered between the limits of 4 and 24 v.d. per second by shift of the lower end in a vise, or finally by the production of deep difference tones. (See AUDITION.) For experiments in pitch discrimination and for studies of clang tint and tonal fusion (see FUSION), other sources of tone are useful. Besides many musical instruments we may mention reed boxes, organ pipes, sirens, and the sonometer. For the study of rhythm the metronome, or the cardboard disk pierced by holes and rotating across a tube conducting a tone, is employed. Localization of sound, i.e., judgment of the distance and direction of sounds without the aid of other senses, is studied by means of the *sound cage.* The observer sits with his head clamped at the centre of a sphere whose surface is generated by rotation of two semicircular arms, one of which carries a telephone receiver. He reports the apparent position of the click of the receiver, while its actual position is determined by the reading of two scales at the points of rotation of the separate arms.

Psychological Optics. Psychology borrows from the oculists their various tests of acuity of vision and from the physicists their manifold photometrical devices. Color mixture is studied by means of the *spectrophotometer*, which enables us to measure wave lengths and to mix spectral lights in variable proportions and at variable intensities, or (more usually) by means of disks of colored paper slit along one axis, fitted together to form a single compound disk, clamped at their centre upon an axle, and rotated with extreme rapidity by hand or by the electric motor. Under such conditions the colors cancel or blend according to their proportions and their sensory attributes. The color mixer may also be employed for sensible discrimination of lights and colors and for the measurement of contrast effects. The phenomena of indirect vision are investigated by the use of the *campimeter* or *perimeter*. The latter is a semicircular arm which can be rotated about its midpoint so as to generate a hemispherical field. The observer fixates the centre of the field, and colored disks are moved along the arm in its various positions. He reports their appearance as he thus (indirectly) sees them. When various colors have been shown at all points of the field, maps of the zones of retinal sensitivity may be platted. The campimeter serves the same purposes as the perimeter, but its field is plane instead of hemispherical. Color blindness is tested most simply by the matching of selected skeins of colored worsted (*Holmgren test*). More reliable results, however, are obtained by the use of Hering's instrument, which enables us to produce fine gradations of colors and lights by the mixture and occlusion of transmitted lights. The subject of color blindness has attracted much attention, and various forms of test, of all degrees of accuracy, have been employed. For the study of perception of space in the third dimension, the *stereoscope* and *pseudoscope* are indispensable. The latter is a converting stereoscope, i.e., a stereoscope whose lenses or prisms give us an illusion of inverted tridimensionality, hollows appearing in relief and conversely. This department of psychological inquiry is rich in research instruments, which expose threads, lines, or edges at different (and, of course, unknown) distances from the observing eye. There are also special instruments for the sudden brief exposure, on a dark field, of words or figures, which are to serve as the starting point of a train of association; others for the serial exposure of words or colors which are to be memorized; and yet others for the test and control of the visual imagination.

Haptics and Organic Sensation. The first requirement in the field of cutaneous sensation is a set of *pressure, temperature,* and *pain points.* These are of wood, metal, or hair. Various means have been devised for regulating the intensity of pressure, the temperature of the applied point, etc. One instrument for this purpose is the *kinesimeter* of Hall and Donaldson, which passes pressure or temperature points over a selected area of the skin, at a constant rate and intensity. The least noticeable pressure is determined by a series of small and accurately graded *touch weights*, or by a series of hair points, the area and bending weight of which are known. Discrimination for pressure is measured by weights, laid upon the resting skin; discrimination for lifted weights (in which pressure coöperates with the articular and tendinous sensations), by cylindrical weights of hard rubber, filled with shot, which are lifted successively in pairs and thus compared. Sensitivity to temperature and pain is determined by the application of *temperature cylinders* and of the *algometer* to a chosen portion of the skin. The algometer may be a needle or a rod covered at the exposed end with cloth or chamois leather and working against a spiral spring; the amount of pressure which evokes pain is read from a scale laid along the spring. The *æsthesiometer*, in simplest form, is a pair of ordinary drawing compasses, tipped at the ends with hard rubber. The object of the instrument is to show us how far apart two cutaneous pressures must lie if we are to perceive them as separate; and, again, what separation of the compass points at one part of the skin gives a separation, in perception, equal to that of a given separation of the points at another part of the skin. The least amount of movement that can arouse an articular sensation is given by the *arm board*, a hinged board upon which the observer lays his hand and arm (bringing the elbow over the hinge), and which is then very gradually raised or lowered by the experimenter. Discrimination of kinæsthetic sensations may be tested by the finger-movement and the arm-movement apparatus of Cattell and Münsterberg. In both of these the finger is inserted in a car, which travels for a prescribed distance along a track; the observer then tries to reproduce the movement by memory. The static sense (sensation of dizziness) is studied by the *rotation table*, a flat bed or table upon which the observer is stretched, and which can be twirled round, in the horizontal plane, at constant rates. Perception of the movement and position of the whole body is investigated both by the rotation table and by the *tilt board*, a similar instrument, in which the table can be swung through approximately 180° in the vertical plane. The observer, strapped upon the table, estimates the extent and direction of movement, the true values of which can be read from a scale.

Taste and Smell. For the study of gustatory sensation we need very simple appliances: a magnifying glass or concave (enlarging) mirror, for bringing out clearly the separate papillæ of the tongue; fine camel's-hair brushes, for the application of stimulus; and sets of solutions, of varying strength—sweet (sugar), salt, sour (tartaric acid), and bitter (hydrochlorate of quinine). For the study of olfactory sensation, on the other hand, we need a special (and in some of its forms highly complicated) instrument, the *olfactometer* of Zwaardemaker. In principle, the olfactometer consists of a glass tube, bent up at right angles to enter the observer's nostril and passing through an odorless screen of wood or metal, which prevents the access of any foreign odor to the nose. Over the portion of the tube that projects behind the screen is slipped an "olfactory cylinder," a glass-cased tube of some odorous matter, such as rosewood or asafœtida. When the cylinder is pushed hard against the screen, its outer edge is flush with the end of the glass inhaling tube, so that nothing of its substance can be smelled. If, however, it be pulled out, say for 1 cm., then the current of air which reaches the observer's nostril must pass over this length of exposed odorous surface before it enters the inhaling tube. If the cylinder be pulled out still farther, then the incoming air current must pass over a still greater odorous surface. We have in this way a means of regulating quantitatively the stimulus that we are applying to the sense organ.

Affective Processes. Under this heading we must give a brief general account of the *graphic method.* The essentials of the method are three in number. We must have (1) a *recording surface*, on which the curve is to be traced. This generally takes the form of a brass drum, rotated by weight or motor or clockwork and covered with a sheet of smoked white paper. It is called a *kymograph.* We must have (2) a *time line*, i.e., a tracing marked off into divisions which represent known time units. We may, e.g., attach a little strip of parchment to one of the prongs of an electrically driven tuning fork and lay the tip of this strip tangentially against the revolving drum. As the drum moves and the fork vibrates, the movement of the strip will be drawn out into a sinuous curve, each wave of which represents the time unit of the vibrating tine. The curve shows white upon the drum surface, since the moving strip knocks off the soot at the point of contact. Finally (3), we must have special apparatus which shall write upon the drum, above the time line, the course of the process under investigation. Such apparatus are actuated, for the most part, either by a mechanical lever system or by air transmission. For example, in registering the course of breathing, we employ air transmission. We connect the stems of two little funnels by a piece of rubber tubing and stretch a sheet of thin rubber over their two heads. If we press the elastic covering of either head, the covering of the other will evidently bulge outward. Let us, then, apply the first head to the observer's chest and hinge a light lever (which we apply to the drum surface) to the other. As the chest rises and falls in respiration, the lever on the second funnel head will rise and fall correspondingly, and we have our curve traced upon the kymograph. The funnels are known as *Marey's tambours.* In the *sphygmograph*, or pulse recorder, the free tambour is laid over the radial artery of the wrist, and the pulsations of the artery are reproduced upon the drum. In the *pneumograph*, or breathing recorder, this tambour is replaced by an elastic girdle, passed round the thorax; this opens into the connecting rubber tube, and the curve is traced as before. In the *plethysmograph*, or volume recorder, the tambour is replaced by a glass vessel containing air or water. The hand or arm is inserted in the vessel, which is then hermetically closed, save for the tube connection to the writing tambour. As the inclosed member changes in volume, the writing point rises and falls upon the kymograph surface. Lastly, in the *dynamograph*, or strength recorder, the free tambour is replaced by a heavy steel spring, which is gripped by the hand; as the pressure increases or relaxes, puffs of air are sent along the connecting tube to the writing lever, and the fluctuations of muscular strength are correctly registered. It is also necessary to record the involuntary movements of arm and hand. For this purpose we use the *automatograph*, a scientific modification of the once popular planchette. The course of fatigue may be followed by means of the *ergograph*, which records the work done in a continuous pull against a spring or in the successive lifting of a constant weight.

Action. The simplest instrument for the performance of reaction experiments (see REACTION) is Sanford's *vernier chronoscope.* It consist of two pendulums, of slightly different lengths. The one is started by the opening of a key, simultaneously with the giving of the stimulus (the signal for movement); the other, by the opening of a second key, pressure upon the button of which constitutes the movement of reaction. The two pendulums swing together on the principle of the vernier; and the number of swings made, before coincidence is reached, gives the reaction time in fiftieths of a second. A more elaborate arrangement is the *Hipp chronoscope*, an electric clock, with a unit of a thousandth of a second. The clock is started by the giving of the reaction stimulus and arrested by the reaction movement. The stimulus may be given by the swing of a pendulum, which sends a ray of light or exposes a patch of color to the observer's eye; by the fall of a hammer upon a metal block; by a pressure upon the skin, etc. In every case the instrument employed is in electrical connection with the chronoscope. The movement of reaction may be made by hand or foot, by voice, by lips, or eyelid. Whatever the form of "reaction key" employed, it too is always in electric connection with the chronoscope. Again, the time of reaction may be recorded directly, by time markers, upon the surface of the chronograph, a kind of kymograph, provided with tuning-fork controls that give an exceedingly accurate time line.

Attention. The fluctuations of attention are measured by very faint auditory or visual stimuli, e.g., by the ticking of a distant watch, the continuous fall of a little stream of sand, or the light gray rings on white ground produced by rotation on the color mixer of a disk of white cardboard, on which is drawn a broken black radius (*Masson's disk*). Distribution or distraction of attention is studied by the *complication pendulum*, an instrument which presents to the observer, at one and the same moment, impressions of sight, of sound, and of touch. The range of attention, i.e., the number of objects simultaneously apprehensible by a single attentive observation, is determined visually by the *tachistoscope* and auditorily by the metronome. The tachistoscope consists, in essentials, of a screen carrying words, figures, or letters, which can be displayed for a fraction of a second by a shutter, like the instantaneous shutter of a photographic camera.

Other Instruments. Apparatus employed in the study of the more complicated mental processes have, as a rule, the special form given them by individual investigators. There are several forms of *memory apparatus*, the essential feature of which is the serial exposure of words, letters, etc., to be memorized by the observer. In work upon recognition it is usual to adopt some one of the pieces given under the headings *Acoustics* and *Optics*. Something has been done, in the study of imagination, by aid of the symmetrical figures formed by folding upon itself a piece of paper upon which an ink blot has been made; recourse is also had to the suggestions aroused by words. Individual psychology has its own materials, of specially prepared proof sheets or pages of printer's pi, letter patterns upon ruled cards, etc. Finally, it may be said that the apparatus described in the body of the article above are, in general, the simplest of their kind; many more elaborate instruments have been devised, as, e.g., for the study of rhythm.

In the light of the above discussion the figures of the plates will be largely self-explanatory. The sound pendulum was first invented by Fechner; it is figured in the form given it by Wundt. The combined color mixer and campimeter was devised by Hering. Figures 2, 3, 4, 6, 7, 8 of this Plate are taken from Titchener's *Experimental Psychology*. The Appunn tonometer is a box containing reeds, differing by 4 v.d.; it is used for investigations of sensible discrimination, etc. The figure of Zwaardemaker's olfactometer shows the appliances used for the simultaneous record of the observer's breathing curve. The Deprez signal is a time marker, replacing the tuning fork referred to in the text. Figures 2, 4, 5, 9, 10 of this Plate are taken from Titchener's *Experimental Psychology;* Fig. 7 is from Sanford's *Laboratory Course.*

Consult: E. B. Titchener, "The Equipment of a Psychological Laboratory," in *American Journal of Psychology*, vol. xi (Worcester, 1900); C. H. Judd, *Laboratory Equipment for Psychological Experiments* (New York, 1907); Tigerstedt, *Handbuch der physiologischen Methodik* (Leipzig, 1908–14); Schulze, *Experimental Psychology and Pedagogy* (New York, 1912); G. M. Whipple, *Manual of Mental and Physical Tests* (Baltimore, 1914–15); and the authorities referred to under LABORATORY, especially the catalogues of instrument makers listed in E. B. Titchener, *Experimental Psychology* (New York, 1901–05). See DURATION; ILLUSION; and MEMORY for illustration.

PSYCHOLOGICAL ASSOCIATION, AMERICAN. A learned society organized in New York, July 8, 1892. Its object is the advancement of psychology as a science, and it has a membership of 295. The society publishes an annual volume of *Proceedings*.

PSYCHOLOGICAL LABORATORIES. See this title under LABORATORY.

PSYCHOL'OGY (from Gk. *ψυχή, psychē*, breath, life, soul + *-λογία, -logia*, account, from *λέγειν, legein*, to say). Psychology may be defined as the science of mind. More exactly it is the science of mind considered for the sake of mental facts and processes alone, and apart from their values or consequences. It is thus distinguished from the other mental sciences: from logic, which is concerned with the truth or error of reasoning processes; from epistemology, which is concerned with the validity of perception; from metaphysics, which deals with the consistency and reference of fundamental conceptions; and from ethics, which is concerned with ideas in relation to their influence upon conduct. Psychology is distinguished from all these, while at the same time it necessarily covers the same territory in considering the mental facts with which they also deal. What distinguishes psychological science is its point of view, which is primarily the observation and analysis of the immediate psychical phenomenon whatever its nature.

The most important works which appeared before the advent of modern philosophy, works which the modern psychologist cannot afford to neglect, are Aristotle's treatise *De Anima* with its appendices, the *Parva Naturalia*, and the *Summa Theologiæ* of the scholastic philosopher Thomas Aquinas. For Aristotle's psychology, consult the works of Wallace (Cambridge, 1882) and Hammond (London, 1901). For general histories of Psychology, consult: Carus, *Geschichte der Psychologie* (Leipzig, 1808); Harms, *Geschichte der Psychologie* (Berlin, 1878); Siebeck, *Geschichte der Psychologie* (Gotha, 1880, 1884); Dessoir, *Geschichte der neueren deutschen Psychologie*, part i (2d ed., Berlin, 1897).

The principal stages in the development of modern psychology may be characterized as the philosophical or metaphysical and the empirical. The former conceived of mind as substance or as activity (see MIND), and sought to determine the nature of mind and its relation to matter (monism versus dualism, spiritualism versus materialism) and to classify the various activities of mind. It may be said to culminate in Hegel (Wallace, *Hegel's Philosophy of Mind*, Oxford, 1894), though it has continued in the purely introspective works of the Hebartian school. The term "philosophical psychology" is still employed at the present day for the discussion of such problems as the nature of mind (whether there is a mind substance or whether the mental processes as given constitute mental reality—substantiality versus actuality), the ultimate elements of mental experience (intellectualism versus voluntarism), and the relation of mind to body (parallelism versus interaction).

Empirical psychology takes mental experience as its subject matter; but interpretations of mental experience are so numerous and conceptions of the end or aim of the science are so diverse that radically different systems result. In the rough we may distinguish descriptive, explanatory, and scientific or experimental psychology. The first two represent differences in aim and method, while the last is distinguished principally by a clearer and more scientific point of view and is both descriptive and explanatory. The first effort at a purely descriptive psychology began with the conceptions of popular psychology, i.e., with mind as thinking, feeling, remembering, judging, and the like, and attempted to force these conceptions into a logical system of faculties or powers. Ultimately the faculties themselves became explanatory. This faculty psychology (see FACULTY) had its beginnings in Aristotle, reached its climax in Wolff (*Psychologia empirica*, 1732; *Psychologia rationalis*, 1734), and was finally overthrown by Herbart. The second attempt at a descriptive psychology began with the division of the world of experience into two kinds, inner or mental and outer or physical phenomena. The former constituted the subject matter of psychology. At this stage psychology made the mistake of confusing the problem of knowledge with that of the description of experience itself; since we not only perceive but also know that we perceive, the observation of mental phenomena seemed to be different from that of physical phenomena. This belief led to a distinction between inner perception and outer perception; psychological observation was by means of inner perception or introspection, and the psychology which resulted is called inner-sense or introspective psychology. Its roots are again very old; its classical expression is found in Locke (*Essay Concerning Humane Understanding*, 1690); it is the basis of the descriptive psychology of Herbart (*Psychologie als Wissenschaft*, 1824–25); and it is still to be found in the works of those psychologists who have not divorced logic and epistemology from psychology, as, e.g., Brentano (*Psychologie vom empirischen Standpunkte*, i, 1874).

The psychology of inner sense had, however, one signal merit: it was analytical. And the analysis of mental phenomena into simpler processes led to the synthetic and explanatory problem of the connections and functions of these processes. The systems of empirical psychology which emphasized explanation rather than simple description are for convenience included under the term "explanatory psychology." Here belongs the associationist school of psychology (see ASSOCIATION OF IDEAS). It includes the great names of English philosophy from Thomas Hobbes down to John Stuart Mill and Alexander Bain. There is still a confusion of the logical or epistemological aspect with that of psychology proper, but in a different way from that of inner-sense psychology. The simplest elements of experience are now least bits of knowledge, and the complex processes, e.g., perceptions, are sums or aggregates of these elements. The associationist position has been largely transcended, though the epistemological reference still remains prominent in the English and American works of J. Ward, W. James, and G. F. Stout. In Germany the first important principle of explanation was Herbart's mechanics of ideas. Herbart's assumptions were metaphysical, but his attempt to represent mathematically the power of attraction and resistance of his ideas was a distinct advance. His influence is still to be found in Theodor Lipps, *Die Grundtatsachen des Seelenlebens* (1883), and in Wilhelm Volkmann, *Lehrbuch der Psychologie* (4th ed., 1894–95). A second principle, and one that led directly to modern scientific psychology, resulted from the striking developments of sense physiology about the middle of the nineteenth century. That mental phenomena are conditioned upon the body had long been recognized; but it was Lotze (*Medicinische Psychologie*, 1852) who first attempted to work out a thoroughgoing account of these conditions; and a few years later appeared G. Th. Fechner's *Elemente der Psychophysik* (1860), and the way was open to a scientific psychology. See PSYCHOPHYSICS.

The one thing lacking before psychology could attain to the rank of a science was a properly scientific point of view. The inner-sense psychology had rid itself of metaphysics, but had substituted the problem of knowledge; the associationists had assumed least bits of knowledge as their starting point; and both Lotze and Fechner were caught between their interest in facts on the one hand and their philosophical tendencies on the other. W. M. Wundt, *Grundzüge der physiologischen Psychologie* (1874; 6th ed., 1908–11), introduces a new era. Psychology has no subject matter peculiar to itself; all science deals with the same world of experience, only from different points of view; mental sciences deal with experience in its immediate, physical sciences with experience in its mediate, aspect. The position was later worked out to logical consistency by E. Mach, *Beiträge zur Analyse der Empfindung* (1886), and R. Avenarius, *Kritik der reinen Erfahrung* (1886–90). Wundt is to be regarded as the father of modern psychology, because he defined its point of view and furnished it with an adequate method; because he continued and extended the experimental work of Fechner by the establishment of the first psychological laboratory in 1879 (see LABORATORY, *Psychological Laboratories;* PSYCHOLOGY, EXPERIMENTAL); and because he brought together and fused into a single system the psychological facts which had been gathered by previous psychologists or had been found as by-products in other sciences. The new movement thus begun in Germany spread first to America, thence throughout Europe, and ultimately to most of the important universities of the world.

The point of view, then, of scientific psychology is to regard as its subject matter all experience that is immediate (Wundt) or that is dependent upon the experiencing individual (Ward, Stout, Külpe, Titchener); and we may further define the experiencing individual as the functional nervous system. The method of psychology is the same as that of other sciences, i.e., observation; we attend to the experience in question and report it. But observation is best made under controlled conditions, so that the experience may be isolated and the observation be repeated and varied; and such an observation is an experiment. The problem of psychology is to describe immediate or dependent experience; and description is analytic and synthetic and includes a statement of the nervous processes which condition the experience. Experience, moreover, may be regarded either as structural or as functional. As a consequence some authors lay more stress upon analysis of structure (Külpe, Titchener), others upon discrimination of function (Ward, James, Stout). The difference is mainly a matter of the psychologist's temperament and training, of the direction (scientific or philosophical) from which he approaches the psychological problem. The important thing is to keep the two lines of inquiry distinct; not to hypostatize function, to invent separate structures that shall carry its separate phases, as is done, e.g., by a psychology which speaks of memories and memory ideas as qualitatively unique processes; and not to translate structure directly into function, as is done, e.g., by a psychology which makes sensation the primary source of knowledge.

The programme thus outlined has proved adequate to the study, not only of the normal human adult, but also of dependent experience whereever it is found. The scope of psychology, therefore, extends from individual to social and racial, from human to animal, from infantile to senile, from normal to abnormal, experience. In one sense all experience is individual, and it is only because the nervous structure and the observations of a number of individuals are essentially alike that we can write a general psychology, the psychology of the textbooks. We may, however, take account of the differences between the experience of individuals and thus have a differential psychology. (See Individual Psychology.) Again, we may analyze the experience of a group of individuals of the same race and epoch who live together in a society in which they mutually influence one another. In such a case certain dispositions are the same; the situations in which the individuals are placed are common to all; and the collective experience which results finds its expression in language, myth, custom, religion, and law. We thus get material for a collective psychology (see Social Psychology), or, as the counterpart of individual psychology, we have a differential psychology of races. (See Psychology, Ethnic.) Furthermore, not all dependent experience is normal; some minds are defective, others temporarily deranged, still others permanently disordered. The study of such experience furnishes problems for abnormal psychology. (See Mental Pathology.) Finally, not all dependent experience is that of the human adult. Animals have sense organs and nervous structures which in many cases are very like our own; we must therefore believe that they have dependent experience which finds expression in their behavior. On this basis of analogy we may construct an animal psychology (q.v.). Similarly we may analyze the individual experience of the infant, the child, and the adolescent. (See Child Psychology.) Or we may take a comparative and genetic point of view and seek to trace the development of mind ontogenetically from infancy to old age or phylogenetically from the lowest forms of animal life, through the animal scale, to mankind. See Genetic Psychology.

If now, in the light of the above classification, we attempt to lay out a complete psychological programme, we shall arrive at some such result as the following. The psychologist will prepare himself for his work by a study of the nervous system at its various developmental levels. Entering upon psychology proper, he will seek to determine, on the structural side of mind, the number and nature of the mental elements, the patterns upon which they are arranged in the complex processes, and the gradual growth in intricacy of these patterns as mental development proceeds; on the functional side, the nature of the root functions of mentation, the mode of coöperation of these functions in the developed mind, and their gradual growth in complexity from the infant to the man. In his study of function he will be keen to note differences, individual variations as well as uniformities. He will, further, give some attention to the questions of classification and arrangement of the typical mental formations, keeping the genetic principle well in view. He will endeavor to extend his knowledge of mental function beyond civilized humanity to the animals and the lower races of man, and to trace the psychological laws underlying the great products of the collective mind. Here, too, his work will be informed by the genetic spirit. During his occupation with normal phenomena he will not neglect the observation of the abnormal. Finally, he may attack the questions that lie on the border line between science and philosophy, the questions of the appearance of mind in the evolution of the universe, of the criterion of mentality in the lowest animals, of the ultimate nature of mind, of the relation of mind to body; or he may turn the results of his scientific inquiries to immediate practical account, embodying them in some psychologically grounded system of ethics or of education. The programme is too large for any one man to cover; and the interests which it demands, philosophical, scientific, practical, would hardly appeal, in any case, to a single personality. But we can see that it is unitary and self-consistent.

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PSYCHOLOGY, Applied. A popular term designating a body of facts of psychological nature, either obtained or selected and interpreted with a view to the guidance of practice. Applied psychology, whose ultimate concern is the establishment of practical rules, is thus contrasted with theoretical psychology (see Psychology; Individual Psychology), whose concern is the discovery of scientific truth. Extended applications have thus far been made in the fields of education (see Child Psychology; Mental Tests), of law (see Testimony, Psychology of), of medicine (see Psychotherapy), and of business. In the latter field special study has been made of the psychological factors in salesmanship and in advertising, and psychological methods have been used to investigate the influence upon work of lighting, ventilation, temperature, fatigue, monotony, etc., to determine the efficiency of movements, to ascertain aptitude for vocations and positions, and to test various modes of industrial training.

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PSYCHOLOGY, Ethnic, or Ethnopsychology. A department of psychology as yet hardly susceptible of exact definition. We may describe it, provisionally, as the individual psychology of races, tribes, or peoples. While it seeks to analyze and depict the mental peculiarities of societies or communities, still it is not concerned, as is social psychology (q.v.), with the mental products of the common life of man; it seeks rather, by methods of statistical comparison and averaging, to construct the typical individual of the tribe or people under consideration and thus to make clear his resemblances to, and differences from, the typical individual of the textbooks of descriptive and experimental psychology. Ethnopsychology thus attempts the same problem in the sphere of racial types that ethology (in Mill's sense of the science of character) attempts in the sphere of the individual variations of human tendency and endowment (Wundt). It stands to the physical and physiological parts of ethnology (ethnogeography, anthropometry, etc.) as psychophysics stands to physiology. Ethnopsychology, as thus defined, forms, together with the histories of language, myth, and custom, the necessary propædeutic to social psychology. Under its province would fall, e.g., an investigation of the keenness of perception (sight, smell), or the æsthetic tastes, or the superstitious beliefs of the savage; a study of the relative parts played by reason and emotion in the Anglo-Saxon and the Latin minds; a comparison of the minds of the Oriental and of the Occidental—inquiries varying in scope from the cleanly formulated questions of normal psychology to the widest generalizations of which the science of mind is capable, but all aiming at a single end, the individual characterization of the mentality of a racial group. It must, however, be repeated that the term "ethnopsychology" has not hitherto found general acceptance, and that many authors discuss topics like those just mentioned under the headings of anthropology, ethnology, and sociology (qq.v.).

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PSYCHOLOGY, Experimental. A comprehensive term for those phases of mental science which are variously called the new psychology, psychophysiology, physiological psychology, and psychophysics. It may be defined as the exact science of mind (see Psychology) and as such is not a department of psychology, coördinate with other departments, but rather a psychology dominated by a certain method. Kant said, in his *Metaphysische Anfangsgründe der Naturwissenschaft*, that psychology could never be a science, (1) because mental process has but one dimension (time), and where you have but one dimension you cannot apply mathematics to your subject matter, i.e., cannot handle it scientifically; (2) because no sane person would submit himself to your psychological experiments, even if you devised them; and (3) because the employment of psychological method, or introspection (q.v.), changes the objects upon which it is directed and so precludes the possibility of uniform results. Kant was, however, blinded by his a priori assumptions; he shared with the great German philosophers since Leibnitz (q.v.) a hearty contempt for the "lower faculty of knowledge" or sense perception (see Faculty); and he was unduly impressed by the worthlessness for science of the "empirical" psychologies of his own day. Hence he could not see, as we do, that, wherever in the past there had been scientific discussion of the facts and laws of perception and of the physics and physiology of voluntary action, important contributions had been made to a future science of experimental psychology. Indeed, it is only in the latter half of the nineteenth century that the three Kantian objections have been finally answered and that psychology has taken rank as a science among the sciences.

The argument that mathematics is inapplicable to mental processes was brilliantly met by Herbart (q.v.), who pointed out that our inner experience shows differences not only of duration, but also of intensity, and expressed the course of ideation, as a function of these two variables, in a series of mathematical formulæ. Herbart's "mathematical psychology" is now out of date; the method that he, as a pioneer, followed has not stood the test of time. But his service to the cause of mental science is none the less real and enduring. The second and third objections have been overcome by the work of Fechner and Wundt (qq.v.), whose *Elemente der Psychophysik* (Leipzig, 1860) and *Grundzüge der physiologischen Psychologie* (6th ed., ib., 1908–11) mark epochs in the development of the new psychology. No one could urge, after the publication of the *Psychophysik*, that psychological experimentation with human subjects is impossible. Fechner experimented, systematically and successfully, with himself and with others, upon a long list of special problems; and the methods which he prescribed are those employed to-day in psychophysical investigations. Wundt put the matter beyond the reach of controversy by his foundation of the first psychological laboratory (see Laboratory, *Psychological Laboratories*) at Leipzig in 1879. Wundt appears, further, to have been the first to use the phrase "experimental psychology," which occurs in his *Beiträge zur Theorie der Sinneswahrnehmung* (1862). His services both to psychology proper and to psychophysics can hardly be overestimated. We have to note here, in particular, his insistence that the psychological experiment consists simply in a carefully guided and rigidly controlled introspection, i.e., his refutation of Kant's third objection. A single instance must suffice. "The sensation," says Wundt, "contains in it no reference to the organs by whose external or internal stimulation it has been aroused; it tells us nothing of the character of its stimuli; it comes to us as a simple quality, giving no hint of any means whereby we might define that quality more nearly." In other words, the sensation is its bare qualitative self, devoid of all objective reference. When we remember that the sensation of the faculty psychology, as of the English empirical psychologists, has always been a bit of sense knowledge, a mental state or process that informs us of something in the outside world, we see what an advance in insight and scientific method is implied in Wundt's formulation.

The sources from which experimental psychology has drawn are manifold. It is especially indebted, for fact and for inspiration, to physics, astronomy, and the physiology of the organs of sense. Until psychology has laboratories upon the scale of those devoted to physics and physiology, it must be in large measure dependent for exact investigations upon the representatives of these older disciplines; while, in any case, the labors of men trained in general scientific method cannot fail to be of high value in this particular field.

What, now, we may ask, are the provinces of mind which the new psychology has made peculiarly its own? In principle there is no psychological problem that cannot be experimentally attacked. In actual fact, owing to the youth of the science, its lack of material means and of trained workers, and the extreme difficulty of its subject matter, there are very many problems that still await the experimenter. If we are to attempt a catalogue of what has been accomplished, we must begin (1) with the fields of sensation and of sense perception. The literature of these subjects—of vision, audition, and the rest of the sense qualities, of spatial and temporal perception (see Duration; Extension), and of qualitative perception (see Fusion)—has already attained very considerable proportions. When Helmholtz published, in 1867, his great work on physiological optics, it seemed that he had exhausted the subject, that its difficulties were resolved once and for all. But what was judged to be the end has proved to be only the beginning; the work of many men has accumulated and is still accumulating, bringing new facts and new questions. And as here, so elsewhere: experiment is taking us toward an exact doctrine of sensation and perception, whose complexity had, before its advent, been not so much as guessed at. (2) The psychology of attention (q.v.) may almost be termed a positive creation of the experimental method. It is strange and instructive to turn from a modern system of psychology, in which the doctrine of attention looms so large and important, to a German eighteenth-century work, or a volume of English associationism, where (except for a few scattered hints) we find no mention of it whatsoever. (3) The same thing may be said of the psychology of action. When F. C. Donders, in 1866, proposed to use the method of reaction for the measurement of mental acts like choice, discrimination, and judgment, he was building better than he knew; for the laboratory reaction, the exact type of a voluntary action, has been the chief aid towards a final analysis of the active consciousness. (4) H. Ebbinghaus' *Das Gedächtnis* (1884) brought the function of memory under experimental control and has been followed by many monographs upon recognition and the various conditions of the reproductory consciousness. (5) Finally, the feelings are gradually submitting themselves to experimental treatment. Fechner himself laid the foundations of an exact science of experimental æsthetics (q.v.); and Mosso's researches into the bodily symptoms of affective processes have borne rich fruit. If we cannot say that experiment has given us a settled psychology of feeling, we can at least assert that the issues are more clearly marked and the problems more definitely formulated than ever before; and this means that it is only a matter of time until our questions are adequately answered. See ÆSTHETICS, EXPERIMENTAL.

There has been some dispute as to whether certain results of animal psychology (q.v.), of physiological experimentation on the brain cortex, of the treatment of brain disease, and of tests made upon hypnotized subjects (see HYPNOTISM) should be included under the phrase "experimental psychology." Such inclusion depends partly upon our definition of the word "experiment"—experiments on animals and on hypnotic subjects are of a different order from those described above—and partly on the extensibility of the word "psychology," upon the point, i.e., whether all that furthers or contributes to a science is necessarily itself a part of the science. It is, however, more important to note that psychology has gained or may gain from all these four sources than to find a single name for them.

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PSY′CHOPATHOL′OGY (from Gk. ψυχή, *psychē*, breath, life, soul + πάθος, *pathos*, disease + -λογία, *-logia*, account, from λέγειν, *legein*, to say). A synonym for mental pathology. The term is wider than psychiatry (q.v.), since it covers all study of the mental symptoms of disease, without special reference to therapeutics. It is narrower than abnormal psychology, since (at least in current usage) it deals only with serious mental derangement, and not with such slight and transient abnormalities as dreaming and hypnosis.

PSY′CHOPHYS′ICS (from Gk. ψυχή, *psychē*, breath, life, soul + φυσικός, *physikos*, physical, from φύσις, *physis*, nature, from φύειν, *phyein*, to produce; connected with Lat. *fui*, I was, Skt. *bhū*, to become, and ultimately with Eng. *be*). The science of the interrelations of mind and body. The term was coined by Fechner to designate an exact science of the relations of dependence between the physical and psychical worlds. He discriminated an internal and an external psychophysics: in the former, sensation is considered in its direct relation to the brain and nervous system; in the latter, sensation is indirectly studied in its dependence upon external physical stimuli. No definition could be more general. We have to ascertain the facts and laws of mind and the physiological facts and laws (of brain or of sense organs) with which they are connected; we have to parallel the two series of events, noting how variation in the one is related to variation in the other; we have to express the functional interdependences exactly, i.e., in terms of measurement, of mathematical formulæ; and from our whole inquiry we shall attain a "philosophical" standpoint, a theory of the general relation between the physical and psychical worlds.

Fechner was concerned, primarily, with the problem of mental measurement. And when we turn to his *Elemente der Psychophysik*, we find that he is occupied, for the most part, with the relation of intensity of stimulus to intensity of sensation which is formulated in Weber's law. (See INTENSITY OF SENSATION; WEBER'S LAW.) In the quantitative expression of this relation he saw a fundamental psychophysical uniformity. There is no longer reason, however, for thus narrowing the scope of the science. If we hold to Fechner's own definition, it is evident that psychophysics includes not only measurements of all the attributes of sensation, but also measurements of feelings and their physical accompaniments as well as of the higher mental functions. The percentages of correct associates in memory experiments and the time measurements of the reaction experiment are exact physical data, which express the relation of physical to mental processes as really as measurements of objects which are lifted and arouse kinæsthesis, or which fall and produce sounds.

A word must be said of mental measurement itself and of the methods whereby it is accomplished. We cannot measure mental processes in the same way in which we measure physical magnitudes. A mental process, sensation or other, does not contain within it so-and-so many lesser processes. But we can measure function, sensible discrimination, or the function of memory; and we can measure the differences or distances that separate term from term within a sensation scale. In this case of sensation Fechner himself gave us our units and a number of methods for measuring them. The units are the just noticeable difference or difference limen (see LIMEN) and the supraliminal distance. In Fechner's hands the methods took relatively simple forms; two of them may be described as typical. In what is known as the method of limits a standard and a comparison stimulus are presented. The observer knows that an approach towards equality is being made by a gradual stepwise change, and his task is to say when equality is reached. Then, starting from equality, a series is taken in the opposite direction; and the point is noted at which a difference first becomes apparent. The average of the values obtained from a number of such series is taken as the value of the limen. In the method of constant stimuli a selected number of stimuli are presented many times over in haphazard and unknown order, and the percentage of judgments of "greater," "equal," and "less" is computed for every comparison value. A mathematical treatment of the percentages gives the required value of the limens both above and below the standard. In their simpler Fechnerian forms these methods furnished results whose comparison was difficult, chiefly because of the different psychological conditions (e.g., the knowledge or ignorance of the observer), and the different mathematical principles involved (e.g., the simple average, the law of chance). After Fechner, the methods entered upon a stage of development characterized by critical amendment and extension, especially upon the psychological side; this development found its climax in the work of Müller and Titchener in 1904–05. Since then a new phase has begun, under the leadership of Wirth and Urban, and the establishment of the methods upon the single mathematical basis of the laws of probability seems about to be accomplished.

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PSYCHO′SIS (from Gk. ψυχή, *psychē*, breath, life, soul + *-ωσις*, *-ōsis*). A mental disturbance caused by an active pathological, or disease, process and not an expression of a fixed change in the mind. Psychoses develop from toxins, and the term includes fever delirium, infection delirium independent of fever, chronic nervous exhaustion, collapse delirium (such as rarely occurs after childbirth), alcoholic intoxication, etc.

While neurology, strictly construed, includes psychiatry, the term "neuroses" is commonly used to denote diseases that affect nerve structure and function without producing any mental change; while the term "psychoses" is used to indicate an affection showing mental disorder.

PSY′CHOTHER′APY, or PSYCHOTHERAPEUTICS (from Gk. ψυχή, *psychē*, breath, life, soul + *θεραπεύειν*, to treat medically). Speaking in a general way, psychotherapy includes all of those measures or methods of treatment of bodily or social ills which are based upon the fundamental facts (*a*) that the disorders or diseases to be treated are due to psychical factors and (*b*) that the remedies applied can have some definite effect upon them.

Much psychotherapy is shrouded in conjecture and pretense, in which respect it has evolved like other modes of treatment of bodily ills, but also, like other forms of therapy, it too has come to occupy an important place in legitimate medicine.

To present an historical résumé of the evolution of psychotherapy would take one back to the time of primitive man. From there one would have to trace step by step the gradual advances made in the comprehension of many illnesses, which are based upon the fact that the final product of the evolution of the nervous system, the human brain, has come to deal with the realities of nature by a masterly symbolism, which psychologists term mental action. These mental or psychical activities constituting the mind, as the old-style psychology would term them, have a twofold function, one negative and one positive.

The human body is a gigantic energy transformer. It receives its impulses from the external world through the sense organs, the receptors. The simple a b c physiology of the nursery speaks of these as the five senses, but in reality there are many more than five senses; modern physiology recognizes an enormous number. Take touch as an illustration, which in the naïve physiology of the layman is called one of the five senses. In reality touch is highly complex. It can recognize, first, heat and cold and has special nervous endorgans in the skin and mucous membranes. These endorgans are able to distinguish extremes as separate from minute differences of heat and cold. These latter are a later development in evolution, and the nerve fibres from the skin that carry the impressions to the brain travel in different paths from those which carry the knowledge of extremes of heat and cold. Again touch is separated into pain and pressure. It recognizes two objects lying at different distances and also is able to distinguish the sensations of vibrations, of muscular strains, and of the sense of position.

Thus we see that touch instead of being one sense is more than a dozen different ones. This is also true for sight and taste and sound. There are chemical senses, that recognize the presence or absence of oxygen; that pick out the grades of acidity of the gastric juice; that can tell of the amount of sugar needed in a muscle, or the need for chemicals, such as calcium, to regulate the proper electrical pressures in the "jump sparks" of the nervous system, scattered all up and down the spinal cord and brain.

We therefore have come to recognize that the human machine is played upon by millions of incoming energy stimuli. These are received by the various senses, just spoken of, and are responded to by the human animal in what is known as living and doing. A large group of the incoming energy stimuli are exclusively used to keep the machine alive. They are spoken of in physiology as nutritive. Others offer occasion for the body to seek pleasure and to avoid pain. They cause motion and striving. This striving, reduced to its simplest terms, consists in satisfying the instinct of self-preservation, through the nutritive channels first spoken of, and that of self-perpetuation. For living matter, whether it be a weed or a man, tries not to die, but to live forever. The way that this problem of living forever has been solved by living plants and animals is termed reproduction.

Thus, man, as an energy transformer, takes in energy in order to keep the machine alive and to keep it alive forever—not individually alive, but socially alive, i.e., it builds a social structure.

If one looks with the eyes of the physiologist at this human energy transformer, it can be roughly separated into three periods of evolution. Each of these has its own nervous mechanisms. The physical-chemical needs of the machine are taken care of by the oldest of these; it is called the vegetative nervous system. Man, as a feeling-moving animal, is so by virtue of a sensory-motor system. All of the physical-chemical activities are automatic and unconscious; the sensory-motor activities are voluntary and conscious. The human machine is thus like an automobile standing still with its engine running. The second nervous system throws in the clutch, and man moves; but we still need to consider the third system of nervous activities, i.e., the psychical. They are the directing forces for the others in attaining the two ends already spoken of, self preservation and race perpetuation.

Thus we come to the negative and the positive functions. It is the function of the cerebral mechanism, that is the psyche, i.e., the mind, to direct the automatic nervous system and the conscious sensory-motor system to do useful work. It must prevent anything that threatens to interfere with the proper discharge of life energy in useful work, useful meaning individually and socially valuable.

A psychic disturbance, therefore, and one which needs psychotherapy, is one which is due to a failure to adjust these two functions—the one unconscious, seeking for an outlet in any way, having no reference to social good, and the other conscious, which seeks to direct it, as guided by the training of civilization, to some useful end. Any incomplete or inadequate result is spoken of as a psychical disorder (a psychoneurosis) and results in individual illness and social crippling.

It follows that the manifestations of this inadequacy may show themselves at any of the levels which have been mentioned. Thus at the lowest, i.e., the vegetative level, an emotional shock may cause rapid heart beat, it may turn the hair gray, it may cause sugar to appear in the urine, produce great fatigue, etc. The emotional shock may be acute and simple, such as the death of a husband or a child, or it may be slowly acting and hidden, such as a constant temptation to dishonesty, a continued series of deceptions, or a constant living in a false position, a living down of a social wrong, etc.

At the level of the sensory-motor nervous system the results may be a loss of sensation, a blindness, a deafness, a constipation, or, on the motor side, a paralysis, a muscular weakness.

Finally, at the purely psychical level, the reaction may be a pure mental disturbance, i.e., a psychosis, or a mental disease (incorrectly called an insanity), and still further, socially speaking, these misfits produce many of the social difficulties concerning which agitators talk a great deal because many are too lazy to study them carefully. The psychiatrist, however, is becoming an indispensable ally to the social psychologist in the analysis of these difficulties. In social lines, psychotherapy has thus far been developed only by the great leader, the demagogue, the walking delegate, and the agitator. We shall therefore limit this discussion to that form of individual psychotherapy which makes up a part of legitimate medicine.

We have roughly sketched what a psychic disturbance is. Needless to say, it may mimic any other type of disturbance due to other than psychic causes. It is because of this that legitimate medicine says that only the trained observer is able to say whether the paralyzed limb, let us say, or the blindness, or the sugar in the urine is due to a mental or psychical factor, or to a blood clot in the brain, a syphilis, or a liver disease respectively. Only the trained observer is able to tell this. Any society which by its protective devices, called laws, fails to support trained observers and demand better and better ones and which does not try to prevent the activities of the mountebank, is destined to be undermined and lose its opportunities for highest development. It is as dangerous for a state or nation to permit pseudo-science to treat its most important mental ills as for an individual to neglect a tuberculosis or a syphilis. Psychotherapy therefore becomes one of the most important divisions of medical practice to scrutinize, to aid, and to limit.

Psychotherapy is applicable only to psychical ills, and, as has been said, psychical ills can mimic almost every known form of malady. It is estimated that 50 per cent of all illness is of a psychical origin, but in saying this it should further be emphasized that every bit of it, practically without exception, has some somatic or bodily basis. The road to recovery, however, is chiefly through the psyche and secondarily through the body. To deny the importance of the latter is to shut one's eyes to reality.

Psychotherapy includes all mental influences, from the use of the cheapest charlatanism to that of the highest pragmatic philosophies. That which may be accomplished by a cheap trick for the ignorant coal heaver may have to be worked out with much labor by means of the most tactful dialectics with an educated college professor. A word, a command, may relieve a child of a neurotic paralysis, but it may require years of careful psychoanalysis to eradicate the same in a woman of intellectual and refined cultivation. The use of the command and harsh method for the latter would be as ridiculous as the psychoanalytical method for the former.

Psychotherapeutics is so wide that it is no wonder that it finds its practitioners in all spheres of life. Such have come into existence as a more or less direct outgrowth of the social milieu, and their teachings are more or less adapted to individual needs and ignorance. General laws are inapplicable, but there must be a fundamental principle of moral reëducation in order to obtain permanent results. One may have to run the gamut of bullying and cajoling, of hypnotic procedure, and appeal to social or religious prejudices; one must learn to play upon conceit and vanity, on family pride and desire for social prestige; the entire armamentarium of suggestive influences will be found necessary if one would conquer all cases, and the man is rare who can command them all. Hence in practice one follows his or her natural bent and invariably develops a one-sided or many-sided psychotherapy according to his natural endowment and acquired method.

Such positive psychotherapeutic treatment falls naturally into a few large groups, for the exclusive use of which one finds many special pleaders. The most important of these may be conveniently grouped as *hypnosis*, *suggestion*, *reëducation*, and *psychoanalysis*. In using these categories it is evident that they are not to be understood as different things or as mutually exclusive, nor as exhausting the subdivisions of the subject. They simply indicate general tendencies rather than separate methods.

The concept of *hypnosis* has changed considerably since the early days of Liébault, Charcot, and Bernheim; yet the word is still frequently understood in the sense of an appeal to the miraculous, the superhuman, or the subconscious. Under its modern definition, as only a form of suggestion, it loses much of its significance. As used here, it is understood as a mode of impressing certain ideas on an individual's mind after having, by trick methods, induced a condition of modified consciousness, known as hypnotic sleep, the hypnoidal state, etc.

First, as to its applicability in psychical disturbances, it is generally known that some patients are refractory. They cannot be hypnotized; they usually represent a higher level of intelligence than those who may be hypnotized. In such its efficacy is nil. Among those who are most readily hypnotized one finds the weak-minded and the mental inferiors. The appeal to the marvelous and the apparently supernatural has a great hold upon these, but, since their psychical disturbance is due to their real constitutional mental inferiority, the hypnotic suggestions are of very little permanent value; they simply reënforce and repeat the type of suggestibility that is an essential feature of the disorder.

Another type responds to hypnotic suggestions, not on a basis of weakmindedness, at least not in the sense of general averages, but rather as a pure expression of the neurotic personality. How numerous are the patients who comprise this group it is difficult to decide. To obtain a foothold with these patients it may be necessary to start them with hypnosis, but, with hypnosis alone one rarely cures a severe psychical disturbance. It may be of advantage as an entering wedge, but if continued it only perpetuates the type of reaction the physician is trying to eradicate. Hypnosis, like conversion, seems to make some startling cures, but alone it does not modify the real personality; in fact it renders the neurotic personality more susceptible. It therefore does harm as an exclusive mode of treatment, even when most carefully guarded. One is making real progress in the treatment of a psychical disturbance when the patient has learned to be uninfluenced by hypnotic passes.

In the hands of the unscrupulous or the unpracticed a great deal of damage can be done. The fancied influence for absolute evil that hypnotists are believed to exert on their subjects can in reality be accomplished only in the weak-minded. Such individuals do not need any particular pressing of hands or looking into mirrors to produce their lack of will.

It is a striking commentary on the value of hypnosis in the treatment of a psychical disturbance to find it practically rejected by its warmest advocates of 20 years ago. With the limitation thus outlined, however, it will always persist as a useful adjunct in the beginning stages of treatment for some patients.

A definition of *suggestion* as used in psychotherapy is as unsatisfactory as that of hypnosis. For the restricted purposes of this presentation, suggestion consists in bringing about an emotional state by influences the import of which is not apparent to the individual. It consists in inducing mental associations leading to the modifications of the patient's emotional and therefore psychical state that will make for a better adjustment. Suggestions enter consciousness—either perceived, on the threshold of consciousness, or on its margin—awaken ideas, associations, and in a manner similar to an endless chain bring about what a celebrated Spanish neurologist, Cajal, has well termed "avalanche" action, which has a compelling force on the individual, who may be and usually is unmindful of the origin of the influences. The wise suggester knows how, by little hints and side remarks, by appeal to fear, to jealousy, or to praise, to cause a summation of impulses which have an impelling force far exceeding that of a command. Such suggestions may thus have a very extended action; they may govern the activity of the glands of the heart, or of the vasomotors; they may split definite idea complexes and may so affect the senses that illusions and positive and negative hallucinations may take place.

Suggestion used in this sense, then, is different from command or direct action, and it also differs from persuasion. A loose application of the word "suggestion" confuses these three procedures. Perhaps, after all, the distinctions are superfluous in practice, and the resourceful therapeutist makes use of all three. One may command a patient with a psychic arm paralysis to raise his arm; if the command is uttered suddenly and in emphatic tones, success may crown the effort. One may urge and urge a patient day by day to walk, telling him he is getting stronger and stronger and will soon be well; this is persuasion or mediate suggestion. The neurotic bedridden paraplegic may suddenly get up and run in response to the cry of a child who is in danger; this is a result of suggestion (indirect suggestion). The child's cry, its helplessness, the need for relief, make a continual emotional appeal of such power that the forces of inhibition are stampeded, as it were, and effective action results. By casually commenting on the erect carriage and graceful, easy walk of a fellow patient, an astasic-abasic may be immensely helped, provided the praise and commendation be wisely apportioned and carefully administered. The vanity, the desire for praise, the egotism, the ideals of a patient must be correctly estimated in order to bring about corrective suggestions. Such suggestive treatment is usually combined with a purposeful neglect of the chief appearance in the disease, so far as direct attention or questioning is concerned, and, later, persuasion or complete discussion of the disorder can be added to reënforce the advance started by the suggestive ideas.

Command, suggestion, or persuasion are only symptomatic remedies; they do not change the chief factor which is responsible, viz., the psychical character disturbance. Following the opening which they afford, a more fundamental method is necessary in order permanently to modify the personality and to make a recurrence of the manifestation less probable or impossible.

Reëducation is the ideal psychotherapeutic goal. Psychotherapy aims to reconstruct the individual on a firm basis of reasonable and helpful philosophy that permits him to understand his weakness and his strength, his limitations and his powers. Mills has well summarized a part of its aims in saying: "This method contemplates teaching the patient what he has, what he has not, what he seems to have, what he can do, what he cannot do, and what he simply believes he cannot do." But it is more than this. It concerns itself less with the patient's illness than it does with the steady cultivation within him of that individual mental and moral stability that makes true men and women and not mollusks.

The exposition of the aims to be accomplished needs a short summary of the methods to supplement it. In a quick review of the individual patients one is struck at once with the fact that they are very dissimilar and require quite different treatment. One recognizes that for the imbecile and weak-minded types, for whom perhaps only a cure of symptoms can be hoped for, hypnotism may be justifiable. An appeal to the miraculous relieves for a time, but the patients usually go on their way with ever-changing symptoms. Reëducation for such is a waste of effort, of time, and may squander a pittance which might better be utilized to keep the patient isolated and away from those particular parasites who feed upon the credulity of this type. The manifold fads, cults, and quasi religions derive their followers and endowments largely from this class. Psychoanalysis is the most fundamental form of reëducation. No therapeutic consideration of a psychical disturbance can claim completeness without definite mention of the method originally termed the cathartic method by Breuer and later amplified by Freud as the psychoanalytic method. In its rough form it may be termed the "talking it out" procedure in psychotherapy, and the usefulness of the confessional in Church practice is due in large part to the same principles. Freud's claim that the analytical method is one which acts most penetratingly and carries farthest is undoubtedly well justified, but unquestionably its application has its limitations. Although at first practiced with partial hypnotic additions, psychoanalysts abandon such methods. Freud quotes Leonardo da Vinci as saying: "The art of painting consists in placing little heaps of paint on uncolored canvas where before there have been none, while sculpturing, on the other hand, takes away from the stone as much as covers the surface of the statue contained therein." The method of suggestion acts like the former, that of analysis like the latter.

Freud's technique has slowly evolved, and a presentation that is valid for the present may change in the near future. His general procedure is to place the patient in the recumbent position, the physician sitting behind the patient's head at the end of the lounge. The physician thus remains practically out of sight of the patient, who is then asked to give a detailed account of his troubles and to say everything that comes to the mind, irrespective of its seeming logic or sense and apart from disturbing, mortifying, or unpleasant suggestions. In all such histories gaps are inevitable. These the patient is urged to fill in by thinking closely of the attendant circumstances, speaking aloud all of the floating thoughts that pass during this search ("free association"). All the thoughts are requested to be uttered, notwithstanding their disagreeable nature. The patient must exercise no critique and remain passive. It will be found that the disagreeable thoughts are pushed back with the greatest resistance. This is made all the more striking since the neurotic reaction, i.e., the symptom, is the symbolic expression of the realization of a repressed wish and gives the patient some unconscious gratification. A great effort is made by the patient to retain the symptom, especially as its origin is not really perceived, and since it represents in symbol the individual's former conscious strivings. In psychoanalysis one attempts to overcome all of these resistances and by a series of judicious and tactful probings reconduct into the patient's consciousness the hidden thoughts which underlie these symptoms. Every symptom has some meaning; behind it there lies some associated mechanism, the origin of which the patient unconsciously or partly consciously represses. In the psychoneurotic symbol may be read the cryptic expression of the original thought driven back and hidden.

Slowly to separate and pick apart the mechanism is the object of the analytical method. One needs not only special tact for such excursions into the subtleties of the mental life of some individuals, but also a developed method of interpretation. Every act, every symbolic expression or action, every lapse in speech, every mannerism, needs to be carefully noted, and its bearing must be coördinated. Freud lays particular emphasis on the analysis of dreams, since he believes that in the dream the unconscious or the "repressed conscious" is more apt to reveal itself. Hence a careful reading of Freud's *Interpretation of Dreams* is of the greatest value in this study, also his *Psychopathology of Everyday Life*. In his work on dreams he has developed to the full the chief directions along which his mind has traveled in the psychoanalytical method. It is of the utmost importance to trace back into the earliest years the striking emotional influences that have come into experience, for, for psychoanalysis, the neurotic reaction consists in a perverted type of reaction to these experiences. As is shown, the blurring or loss of an emotional influence—an affect, in short—is due to a number of factors. In normal life forgetting is the commonest type of a corrective adaptation, and forgetting is carried out with special ease if the emotional stress has not been excessive. Forgetting, however, is only a secondary phenomenon and usually is more successful if the immediate reaction has been an adequate one. Such immediate reactions express themselves as tears, as anger, as impulsive acts, etc., and in such reaction the emotion is discharged. In everyday life one calls it giving vent to one's feelings. If, however, the action is repressed, the emotion becomes united to the memory of the experience and an emotional complex results. Freud uses the term "ab-react" (*abreagieren*) to signify the adequate reaction or discharge of such affects or their resulting complexes. Talking the whole thing over, giving vent to one's secrets and confessions, are well-known forms for obtaining relief.

In a psychical disturbance certain of these complexes remain prominent; they are neither reacted too promptly, nor is their unpleasant-feeling tone diminished by the blurring process of forgetting, although it is characteristic of the psychoanalytic point of view that the actual experience which gives rise to them becomes forgotten and the cause of the emotional disturbance which becomes later converted, it may be into physical signs, remains apparently unknown to the patient. It must be dug out by psychoanalysis, and when once discovered catharsis takes place and the patient becomes cured.

It is, further, of importance to realize that abreaction is impossible for certain types of psychical shock or trauma. The inevitable, in the loss of a beloved person, is not overcome by frank discussions; social relations may make it impossible to mention the shock; or, again, it may be that it may concern itself with things which the person wishes to forget and which were intentionally inhibited and perhaps repressed from conscious memory.

In a limited space the full value of the psychoanalytic method cannot be presented. The original writings of Freud must be consulted. Most of the critics of psychoanalysis apparently have not taken the trouble to read them. If truth be often stranger than fiction, certainly the charge of their being romances does not preclude their value. That the psychoanalytic method is very valuable for certain types of cases, especially in a class of the well-educated and cultivated, admits of no controversy, but its application is as yet comparatively undeveloped. This defect is rapidly being overcome. For further discussion, see PSYCHOANALYSIS.

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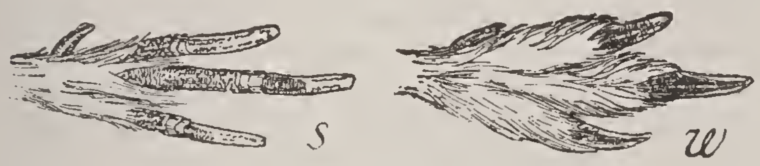
PSY′CHROM′ETER. See HYGROMETER.

PTAH, ptä. An Egyptian deity. See MEMPHIS; and Plate of EGYPTIAN DEITIES.

PTARMIGAN, tär′mĭ-gan (with inorganic initial *p*, from Gael. *tarmachan*, Ir. *tarmochan*, *tarmonach*, ptarmigan). A kind of grouse, differing from true grouse (q.v.) chiefly in having the tarsi and toes thickly clothed with short feathers. The species are natives of northern or greatly elevated regions. They are not polygamous like the true grouse, nor do the males strut with erected and expanded tail. Most of the species change color on the approach of winter, assuming at the autumn molt a white or nearly white plumage in place of the mottled reddish brown of summer. At this season also the shanks and feet acquire longer and denser feathering, and the short summer claws are shed and replaced by a growth of longer, stronger claws, of service in scratching away the snow to get at buried food; and the diversities of color have caused much confusion and difficulty. All are highly esteemed as food and are valued as game birds. Less often seen in Great Britain, but widespread, and numerous in Scandinavia and northern Russia, whence great numbers are sent to market in winter, is a grayer species (*Lagopus mutus*). Two closely allied species, the rock and the willow ptarmigans, range throughout Arctic America, but do not extend southward to the United States. Along the summits of the Rocky Mountains is to be found another species (*Lagopus leucurus*) in which the tail remains white all the year round and which is therefore called the white-tailed ptarmigan, or mountain quail. All make their nests on the ground among the heather or thickets in which they pass their lives and find their food (buds, berries, leaves, and insects), and lay brown eggs very heavily blotched with brownish black. For bibliography, see GROUSE. See Plate of GROUSE, ETC.; and of EGGS OF WATER AND GAME BIRDS.



SEASONAL CHANGE IN PTARMIGAN'S CLAWS.

s, summer condition: foot of willow ptarmigan, drawn June 10, just before the change to the short, summer claw; *w*, winter condition: the same, drawn October 18, showing full-feathered preparation for winter.

PTERANODON, tĕr-ăn′ō-dŏn (Neo-Lat., from Gk. πτερόν, *pteron*, feather, wing + ἀνόδους, *anodous*, toothless, from ἀν-, *an-*, negative prefix + ὀδούς, *odous*, tooth). A large fossil flying lizard, in fact the greatest known flying creature; found in the Cretaceous rocks of Kansas. See PTERODACTYL.

PTERASPIS, tĕr-ăs′pĭs (Neo-Lat., from Gk. πτερόν, *pteron*, feather, wing + ἀσπίς, *aspis*, shield). One of the most primitive fossil fishes of the subclass Ostracodermi, found in the Silurian and Devonian rocks. The front part of the body was covered by dorsal and ventral shields which were made up of several heavy bony plates united by fusion of their joints. The orbits are small and are placed well forward at the very margin of the head shield. The general form of the body was sharklike, its length about 4 or 5 inches; the posterior portion was covered by small polygonal scales. See OSTRACODERMI.

PTERIA, tē′rĭ-ȧ. An ancient city of Cappadocia (q.v.), the capital of the White Syrians, which, according to Herodotus (i, 76), was captured and destroyed by Crœsus (q.v.). The city seems to have been a very important centre of the Hittites (q.v.). The ruins near Boghaz-Kieul (q.v.) are thought to be those of Pteria. As the result of excavations in 1906–07 H. Winckler found, besides important remains of the walls, gates, the citadel, temples, etc., many tablets in cuneiform script, some written in Babylonian, others in a language not yet deciphered; those translatable include diplomatic correspondence with Egypt and the East, dating from the fourteenth and thirteenth centuries B.C. Consult the commentary of How and Wells on Herodotus, i, 95 (Oxford, 1912); H. Winckler, in *Mitteilungen der deutschen Orient-Gesellschaft* (Leipzig, 1909); O. Puchstein, *Archäologischer Anzeiger* (Berlin, 1909); Baedeker, *Konstantinopel, Balkanstaaten, Kleinasien, Archipel, Cypern* (2d ed., Leipzig, 1914).

PTERICHTHYS, tē-rĭk′thĭs (Neo-Lat., from Gk. πτερόν, *pteron*, feather, wing + ἰχθύς, *ichthys*, fish). A genus of primitive fossil fishes of the subclass Ostracodermi, found in Devonian rocks in Great Britain and Germany. The body was from 4 to 8 inches long, broad and high in front, with flattened ventral surface and short tapering tail. The anterior portion is inclosed in large tuberculated bony plates which are firmly united to each other, those of the head shield being articulated by a hinge with those of the body shield. The orbits are placed near together on the forward slope of the head and are separated by a small plate which has on its undersurface a pit for the pineal body. A cleft between the lower margin of the head shield and the front margin of the ventral body shield represents the mouth, and there have been found indistinct traces of bones that are supposed to represent the jaws. At the sides of the front of the body shield are attached two paddle-shaped jointed appendages made up of small closely fitted plates which resemble the pectoral fins of the fishes. The tail portion, which is shorter than the armored portion of the trunk, is covered by small rounded or hexagonal scales, and has a small triangular dorsal fin and an upturned tip on the ventral side of which is a small caudal fin. A close ally of *Pterichthys* is *Bothriolepis*, found in the Upper Devonian of North America and Europe. See OSTRACODERMI.

PTERIDOPHYTES, tĕr′ĭd-ō-fīts (Neo-Lat. nom. pl., from Gk. πτερίς, *pteris*, fern + φυτόν, *phyton*, plant). The fern plants, one of the four great divisions of the plant kingdom, next in order of rank to the highest group, the flowering or seed plants (spermatophytes). In our present flora there are three conspicuous divisions of pteridophytes: (1) ferns (Filicales), (2) horsetails (Equisetales), and (3) club mosses

(Lycopodiales). The pteridophytes have a well-developed vascular system, which is entirely absent in the bryophytes, the next group below them. This system of conducting and strengthening tissues is correlated with the attainment of much greater size and larger foliage display by the fern plants than by the moss plants. It associates them with the seed plants (spermatophytes). Since plants below the seed plants are often called cryptogams, pteridophytes are often called vascular cryptogams. There is also a well-marked alternation of generations (q.v.), which may be illustrated by the life history of a common fern. When a fern spore germinates it produces a green, flat, usually heart-shaped body (prothallium), so small that it escapes ordinary observation. This body bears the sex organs (antheridia and archegonia, Figs. 1, 2, 3). It is therefore the sexual plant or gametophyte and is entirely independent. The egg produced and fertilized upon this prothallium (gametophyte) germinates and produces the conspicuous but sexless fern plant or sporophyte (Fig. 1), upon the undersurface of the leaves of which asexual spores are produced (Figs. 1, 5). When these fall to the ground and germinate they produce prothallia and thus complete the cycle. Pteridophytes differ from bryophytes (q.v.) especially in that their gametophytes are leafless and inconspicuous, and the sporophytes are prominent, leafy, and nutritively independent of the gametophyte. Further, the sperms of pteridophytes are very large, spirally coiled, and bear numerous cilia for swimming (Figs. 1, 4).

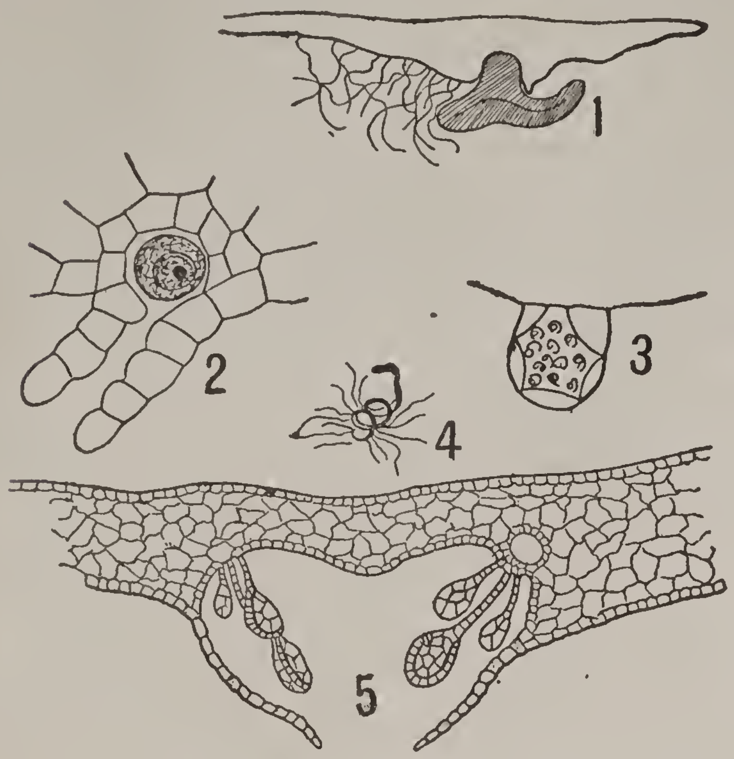


Fig. 1. STRUCTURE OF A FERN.

1, diagrammatic section showing young sporophyte (shaded) in relation to prothallium; 2, section of an archegonium; 3, section of an antheridium; 4, sperm; 5, section of two sori, showing sporangia and indusium.

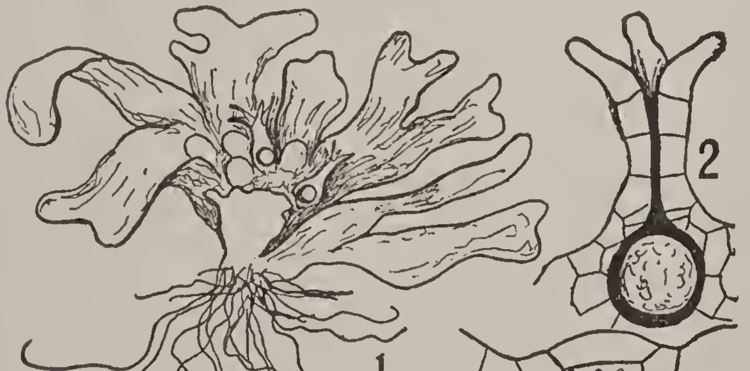


Fig. 2. STRUCTURE OF EQUISETUM.

1, prothallium; 2, longitudinal section of an archegonium; 3, section of an antheridium; 4, a sporophyll with 5 sporangia visible; 5, a spore, showing elaters; 6, a sperm.

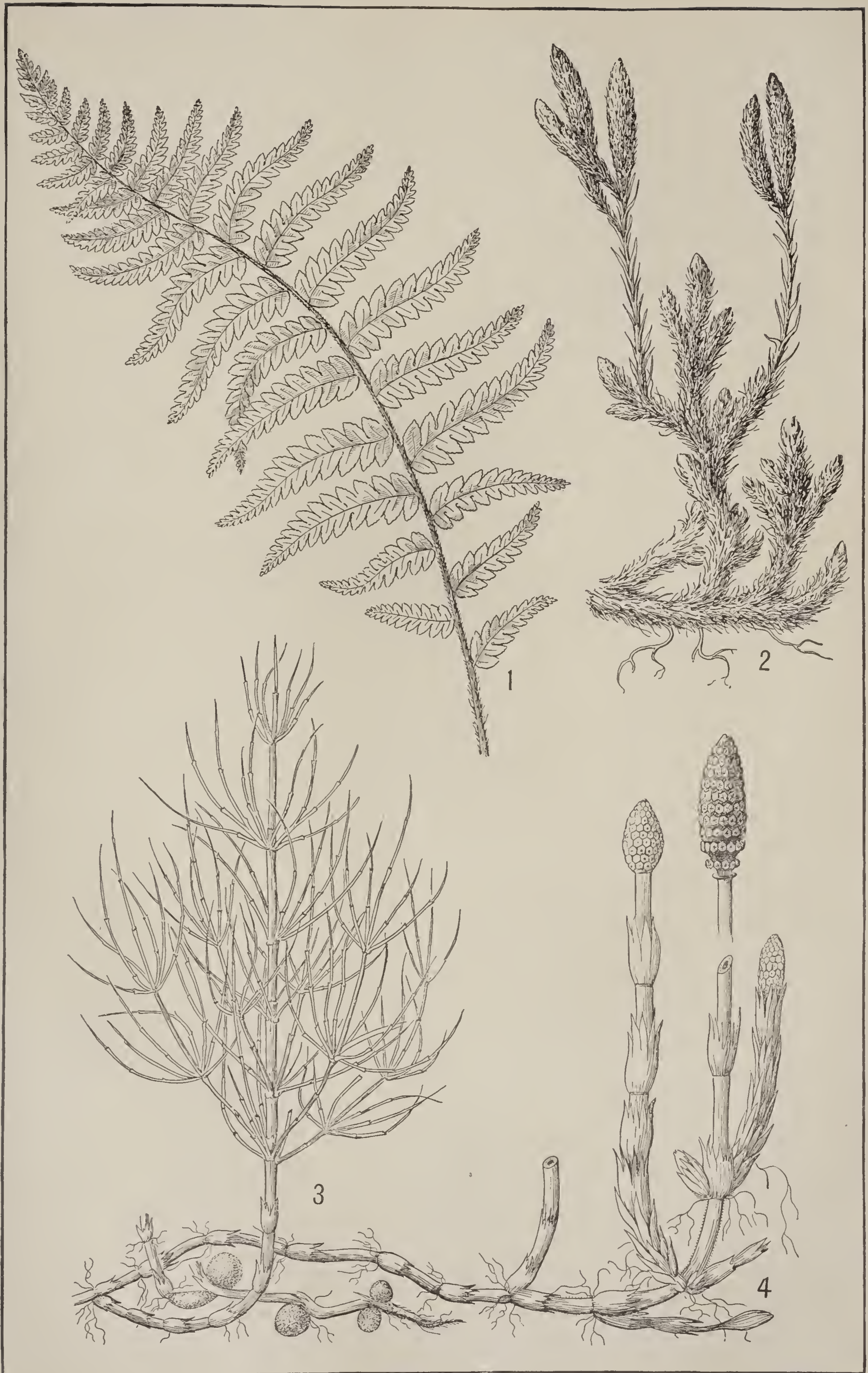
The ferns (Filicales) are the most prominent pteridophytes in the present flora, numbering about 4500 species, chiefly tropical. In habit they are mainly terrestrial, but some tropical forms are epiphytic (perching) and one aberrant group, the water ferns, float or are rooted in water. The peculiar characters are the horizontal subterranean stem, which sends to the surface comparatively few large leaves (fronds), dichotomously veined, usually compound, which bear on the undersurface very numerous spore cases (sporangia) and uncoil from the bud (circinate). The horsetails (Equisetales), which were formerly very abundant and included large trees, now comprise only about 25 small or straggling forms, well marked by their jointed and fluted stems, the absence of foliage leaves, and the terminal conical structure (strobilus), consisting of spore-bearing leaves (sporophylls, q.v.), each of which bears 5 to 10 spore cases (sporangia) on its lower surface (Fig. 2). The club mosses (Lycopodiales), which comprise about 500 species and were formerly much more abundant and conspicuous, are characterized by their slender, trailing, branched stems, thickly covered by small foliage leaves, and by a strobilus consisting of sporophylls, each bearing a single sporangium upon the upper side. The most important feature of the group is that *Selaginella*, the largest genus, is heterosporous. See HETEROSPORY.

The two problems of greatest interest to the morphologist in connection with the pteridophytes are their origin and their relationship to the origin of seed plants (spermatophytes, q.v.). There has been much discussion as to the most primitive pteridophytes, but the weight of evidence at present is in favor of the club mosses (Lycopodiales). It is evident that the greatest gap in the history of the plant kingdom is that between bryophytes and pteridophytes, and for this reason the origin of pteridophytes may remain an unsettled question. The origin of seed plants, on the other hand, has become a settled question since the discovery and investigation of the fernlike gymnosperms (q.v.) of the Paleozoic, forms which were thought to be ferns until they were discovered bearing seeds. Many features of the vascular structure of seed plants also indicate the same origin, so that the fern origin of spermatophytes has become the generally accepted view.

Consult: G. F. Atkinson, *Study of the Biology of Ferns by the Collodion Method* (New York, 1894); D. H. Campbell, *Structure and Development of Mosses and Ferns* (2d ed., ib., 1905); Coulter, Barnes, and Cowles, *Textbook of Botany*, vol. i (ib., 1910); also references under MORPHOLOGY. For works on classification, see under TAXONOMY. See DISTRIBUTION OF PLANTS; EQUISETUM; FERN; LYCOPODIALES.

PTERIS, tē′rĭs (Neo-Lat., from Gk. *πτερίς*, *pteris*, a kind of fern, from *πτερόν*, *pteron*,

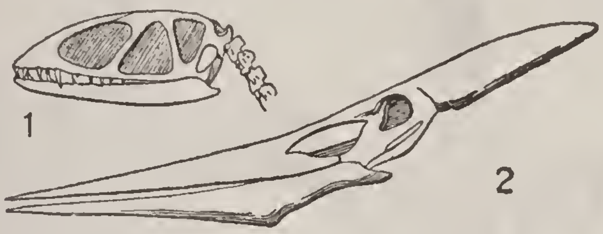
PTERIDOPHYTES



1. FERN 2. CLUB MOSS
3 and 4. HORSETAIL (Equisetum), showing sterile (3) and fertile (4) shoots.

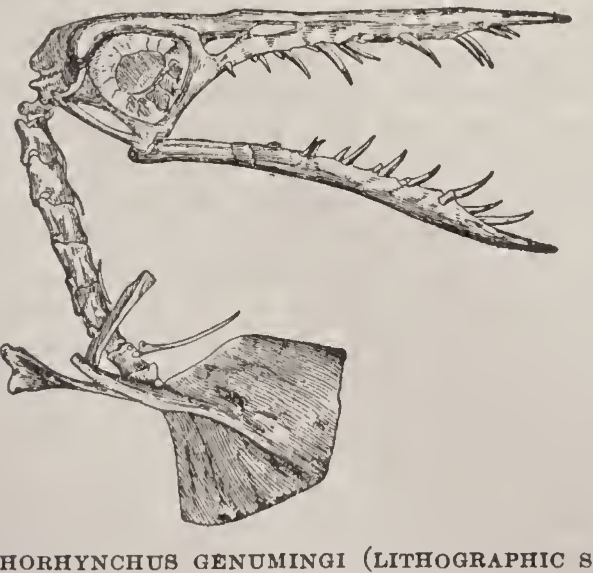
feather). A genus of ferns which includes the common brake or bracken (*P. aquilina*), one of the most cosmopolitan of ferns. It is the original genus of ferns and has given name to the great group Pteridophytes.

PTERODACTYL, tĕr′ō̇-dăk′tĭl (Neo-Lat., from Gk. *πτερόν*, *pteron*, feather, wing + *δάκτυλος*, *daktylos*, finger). The common name for any one of the flying lizards, remains of which are found in the Mesozoic rocks. There are about 20 different genera of pterodactyls, all included in the order Pterosauria (wing lizards), also called Ornithosauria (bird lizards). All the members of this order show a remarkable adaptation of the lizard body to birdlike habits, though in structure they remain essentially reptilian. They cannot be considered as ancestral to the birds, for they constitute a wholly independent line of descent, probably derived from common dinosaurian ancestors, and they present an instructive example of parallelism of evolution due to adoption by two separate races of similar modes of life. The pterodactyls have skeletons of light but firm construction, with hollow bones. The earlier forms had strong, spreading teeth which gradually disappeared in successively later members of the group, and the loss of the teeth was accompanied by a corresponding increase in length and sharpness of the jaws until in the latest genera (*Pteranodon*, etc.) the jaws are dagger-like. The large eyes, surrounded by a ring of sclerotic plates, are placed well back and on the sides of the skull. The body was short and rather stout, the limbs long and slender, and in the earlier forms there was a long slender tail. The wings resembled in general those of the bats rather than those of birds, for they consisted of thin but strong membranes stretched along the sides of the body and supported by the fore and hind limbs and the tail. The structure of the fore limb is quite different, however, from that seen in bats and birds, and presents equally interesting modifications of the parts of the arm in the adaptation of the latter from a walking leg to a winglike organ. The long bones are considerably lengthened, the first, second, and third fingers are small and slender and furnished with sharp-hooked claws, and the fourth is greatly elongated and strengthened to form the framework along which the anterior edge of the wing membrane is attached. Impressions of these wing membranes have in several cases been found so well preserved that the courses of the arteries are easily traceable. The hind limbs are of decidedly reptilian structure and from well-developed organs of locomotion in the earlier members of the group they degenerated to weak-clawed organs of prehension by which the later, more highly specialized pterodactyls probably suspended themselves from points of rocks or from the limbs of trees after the manner of the modern bats.

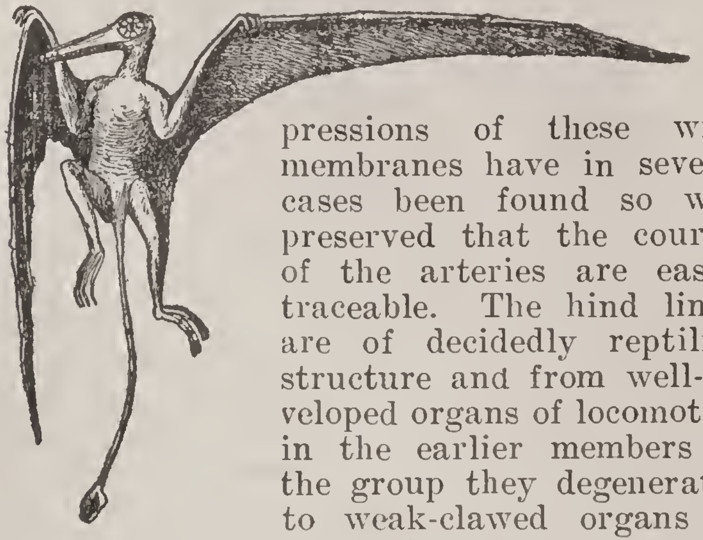


1, *Dimorphodon macronyx;* 2, *Pteranodon*, the toothless, birdlike type of jaws.

PTERODACTYLUS SPECTABILIS.



RHAMPHORHYNCHUS GENUMINGI (LITHOGRAPHIC STONE OF BAVARIA).



PTERODACTYL OF THE GENUS RHAMPHORHYNCHUS (RESTORED).

The various genera range in size from less than 12 inches to about 20 feet in spread of wings. Some of them were evidently able to do little more than sail on leaping through the air, as does the flying squirrel, by means of the stretched membranes; while others were among the most powerful flying creatures that have ever lived. The principal genera are *Dimorphodon, Rhamphorhynchus, Pterodactylus*, and *Pteranoden*, or *Ornithostoma*.

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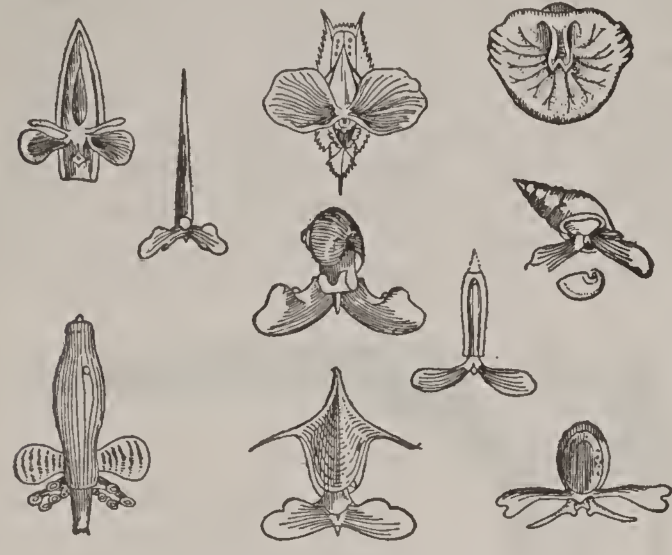
PTEROPODA, tē̇-rŏp′ō̇-dȧ (Neo-Lat. nom. pl., from Gk. *πτερόπους*, *pteropous*, wing-footed, from *πτερόν*, *pteron*, feather, wing + *πούς*, *pous*, foot). An order of gastropod mollusks, agreeing in most of their features with the tectibranch forms like *Bulla*, etc. The head, eyes, and tentacles are usually wanting or vestigial, while on each side of the mouth are winglike appendages, apparently a pair of greatly developed parapodia, giving the peculiar butterfly appearance to these beautiful pelagic mollusks. The shell is conical or helix-like. The species are hermaphroditic. *Limacina arctica* is of the size of, and looks like, a sweet-pea blossom, moving up and down in the water. It is common from Labrador to the polar regions. The largest form on the eastern coast of North America is the beautiful *Clione papillionacea,* which has a head and lingual ribbon. It is an inch long, the body fleshy, with no shell, the wings being rather small. It is likely to occur in vast numbers, and forms the food of whales and other large surface feeders. (See Ooze.) The larvæ of the pteropods pass through a trochosphere stage, spherical with a ciliated crown, and afterward assume a veliger form. (See Mollusca.) The pteropods are in some degree a generalized type. They have a wide geographical distribution and a high antiquity. Consult Von Zittel and Eastman, *Text-Book of Palæontology,* vol. i (New York, 1900), and authorities cited under Gastropoda.

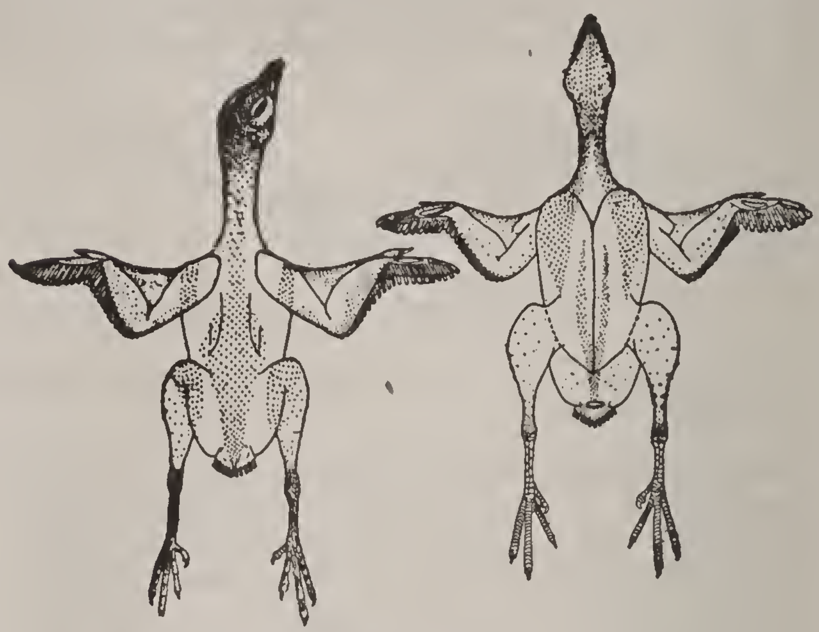


FORMS OF PTEROPODS.

PTEROSAURIA, tĕr′ō-sa̤′rĭ-ȧ (Neo-Lat. nom. pl., from Gk. *πτερόν, pteron,* feather, wing + *σαῦρος, sauros,* lizard). An order of extinct birdlike reptiles with hollow bones, well-formed joints, and with the fore limbs modified for use as wings. See Pterodactyl; Ornithosauria.

PTERYGOTUS, tĕr′ĭ-gō′tŭs (Neo-Lat., from Gk. *πτέρυξ, pteryx,* wing, fin). A genus of Eurypterida, of which some species attained gigantic size, notably *Pterygotus buffaloensis* from the Bertie water lime of New York with a length of at least 10 feet. The genus first appears in the Ordovician, culminates in the Silurian, and extends into the Devonian system. It is characterized by the enormous length of the preoral appendages; these are long pincer-like arms, prehensile in function. The lateral eyes are marginal and distinctly faceted, and the telson is developed into a flat, oval, rudder-like plate. See Eurypterida.

PTER′YLO′SIS (Neo-Lat., from *pteryla,* feather tract, from Gk. *πτερόν, pteron,* feather, wing + *ὕλη, hylē,* wood). The method of growth of feathers in birds. The bodies of most birds are not uniformly covered with feathers, such a condition being found only among the Ratitæ and the penguins. In all other birds the feathers are grouped in clearly defined areas or tracts (pterylæ) with bare spaces (apteria) between them. To this condition, which has high taxonomic value, Nitzsch (*System der Pterylographie,* Halle, 1840) gave the name "pterylosis," and to the aspect of the tracts "pterylography." These tracts are different in the various groups, both in extent and position; but in general it may be said that feather growth is fairly continuous over the head and throat; along the sides of the neck; on the shoulders, wings, tail, and lower part of the thighs, occasionally extending to the toes; in a band of varying breadth and shape down the centre of the back; and in two bands down the lower side of the body, where the central line from the throat to the vent is invariably free. It is believed that pterylosis was not present in ancient birds, which primitively were feathered all over, but is an acquired trait conceived to be advantageous in economy of energy and in making the feathers fit more snugly and lie better with reference to wind and rain. Consult a translation of Nitzsch's work, edited by Sclater and published by the Ray Society (London, 1867); also Hans Gadow, "Pterylosis" in Newton, *Dictionary of Birds* (New York, 1893–96).

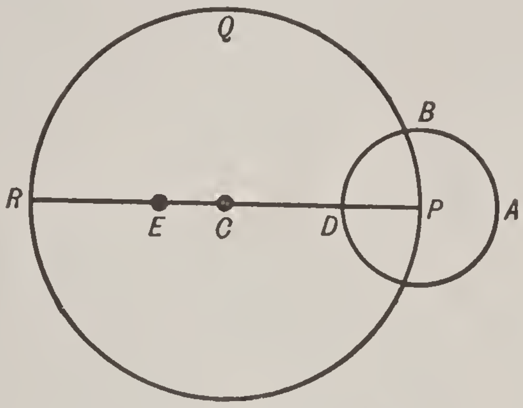


PTERYLOSIS.

Dorsal and ventral views of the body of a quail, showing feather tracts.

PTINIDÆ, tĭn′ĭ-dē. A family of small beetles. See Deathwatch.

PTOLEMAIC (tŏl′ē-mā′ĭk) **SYSTEM.** In astronomy, a planetary theory expounded by Ptolemy (q.v.), the astronomer. It was an attempt to reduce to a scientific form primitive notions concerning the motions of the heavenly bodies. The primary and fundamental doctrines of this system are that the earth is the centre of the universe and that the heavenly bodies revolve round it in circles and at a uniform rate. In the Ptolemaic system the earth, the most stable of the elements, held the lowest place, and supported water, the second in order; above water was placed air, and then fire, ether being supposed to extend indefinitely above the others. In or beyond the ether element were certain zones or heavens, each heaven containing an immense crystalline spherical shell, the smallest inclosing the earth and its superincumbent elements and the larger spheres inclosing the smaller. To each of those spheres was attached a heavenly body, which, by the revolution of the crystalline, was made to move round the earth. The first or innermost sphere was that of the moon, and after it in order came those of Mercury, Venus, the sun, Mars, Jupiter, Saturn, and the fixed stars, eight in all. To this system later astronomers added a ninth sphere, the motion of which should produce the precession (q.v.) of the equinoxes, and a tenth, to cause the alternation of day and night. This tenth sphere, or *primum mobile,* was supposed to revolve from east to west in 24 hours and to carry the others along with it in its motion; but the Ptolemaic astronomers did not venture to explain how this was done, although, since the axis of motion of the *primum mobile* was that of the equator, its extremities being the poles of the heavens, while that of the ninth sphere was the axis of the ecliptic, some explanation was certainly necessary. As observations of the heavens increased in accuracy it was found that the heavenly motions were apparently not uniform, and this was explained as follows: The acceleration of the sun on one side and retardation on the other side of his orbit is only apparent, and results from the earth not being in the centre of his sphere, *C* (see figure), but at *E*, and consequently his motion appears to be slowest at *P* and quickest at *R*. The alternate progression and regression of the planets was accounted for by supposing them to move, not directly with their crystallines, but in a small circle, whose centre was a fixed point in the crystalline and which revolved on its axis as it was carried round with the latter, thus (figure) the planet was carried round the small circle *ABD* as that circle was carried round *PQR* (now supposed to represent the planetary crystalline). The planet while in the outer portion of its small circle would thus have a forward, and in the inner portion a backward, motion. The larger circle was called an eccentric and the smaller an epicycle (q.v.). This theory of eccentrics and epicycles satisfied the early astronomers; but further investigation showed its incompleteness, and in later times it was found necessary to explain newly discovered discrepancies by heaping epicycle upon epicycle. When astronomers came to test the Copernican system the Ptolemaic was discarded. Consult J. L. E. Dreyer, *History of the Planetary Systems from Thales to Kepler* (Cambridge, 1906). See Copernican System; Galileo.



PTOLEMAIC SYSTEM.

PTOLEMAIS, tŏl′ē-mā′ĭs. The Roman name of a seaport of Syria, now known as Acre (q.v.).

PTOLEMY, tŏl′ē-mĭ (Lat. *Ptolemæus*, from Gk. Πτολεμαῖος, *Ptolemaios*). The name of 16 kings of Egypt forming the thirty-first or Macedonian dynasty, which ruled from 323 to 30 B.C.

Ptolemy I (c.367–283 B.C.), surnamed Soter (the preserver), was a Macedonian, the reputed son of Lagus. He displayed marked ability as a soldier and was one of Alexander the Great's favorite generals in his Eastern campaigns. On the death of Alexander (323 B.C.) and the division of his possessions, Egypt and Libya fell to the share of Ptolemy and, while nominally only satrap of these provinces, he was from the first virtually an independent ruler. From this time until about the close of the century he was engaged almost continuously in wars with the various successors of Alexander the Great, in defense of his Kingdom or province. In 306 B.C. he became King in name as well as in fact. Under his able rule Egypt became a power of the first rank. Palestine and southern Phœnicia, Cyprus, Libya, and Cyrene were included in her possessions, and Egyptian influence was paramount in the Mediterranean. The new capital, Alexandria, soon became the foremost city of the world. The famous museum and library founded by Ptolemy I attracted scholars to Alexandria from all parts of the Hellenistic world. The King himself was the author of a history of Alexander the Great, used by Arrian (about 134 A.D.) in the composition of his *Anabasis*. Ptolemy was a wise administrator and skillfully reconciled the opposing interests of his Greek and Egyptian subjects. In 285 B.C., after a successful reign, he passed over the head of his eldest (legitimate) son, Ptolemy Ceraunus, by Eurydice, whom he had repudiated, and abdicated in favor of his son, Ptolemy II.

Ptolemy II (308–247 B.C.), surnamed Philadelphus, the son of Ptolemy I by Berenice, the grandniece of Antipater, reigned from 285 to 247 B.C. He first married Arsinoë, the daughter of Lysimachus, King of Thrace, but eventually banished her and, after the ancient Egyptian custom, married his own sister, Arsinoë. Philadelphus undertook no great wars, and under his peaceful reign Egypt prospered greatly. The security afforded by her maritime supremacy stimulated her Mediterranean commerce, and a great trade developed on the Red Sea with Arabia and the Somali coast. This trade was encouraged by the establishment of new ports, by reopening the old route through the Wadi Hammâmât to the Red Sea, and by planting a colony, Ptolemais Epitheras, on the African coast near the site of the modern Suakin. A canal was also opened from the upper end of the Red Sea to the Nile. An important work, undertaken in the reign of Philadelphus, was the famous lighthouse erected on the island of Pharos, at the mouth of the harbor of Alexandria, by Sostratus the Cnidian. The Egyptian history of Manetho is reported to have been compiled at the suggestion of Philadelphus, and tradition alleges that the King caused the Hebrew scriptures to be translated into Greek by 70 (or 72) elders sent from Jerusalem for the purpose. See Septuagint.

Ptolemy III (c.282–222 B.C.), surnamed Euergetes (the benefactor), the son of Ptolemy II by his first wife, succeeded his father in 247 B.C. and reigned until 222 B.C. He married Berenice, daughter of Magas, the stepson of Ptolemy I, who brought Cyrene as her dowry. In the beginning of his reign he avenged the murder of his sister Berenice, widow of Antiochus Theos, and overran the Seleucid dominions as far as Babylon and Susa. After an absence of three years he was called home by the news of domestic disturbances. He brought with him an immense booty, which included the images of the Egyptian gods carried away by Cambyses. It was the restoration of these images to their proper temples that won him his title Euergetes and furnished the motive for the Decree of Canopus passed in his honor by the Egyptian priesthood in 238 B.C. The war placed Ptolemy in possession of all Cœle-Syria, together with Damascus and the port of Antioch, and gave him the control of the sea up to the Hellespont and the coasts of Thrace. He wisely made no attempt to hold the more distant Asiatic possessions of the Seleucid Empire. Euergetes was a liberal patron of the arts and of literature, and added considerably to the collections of the Alexandrian library.

The splendid temple of Edfu (q.v.) was begun by him, and he also built at Karnak, Philæ, Esne, Canopus, and other places. Under him Egypt reached the highest point of military glory, prosperity, and wealth.

Ptolemy IV (c.244–205 B.C.), surnamed Philopator, the son of Ptolemy III by his wife Berenice, reigned from 222 to 205 B.C. He married his sister Arsinoë, about 212 B.C. Philopator, who is said by Polybius to have been addicted to drunkenness and debauchery, was throughout his reign under the influence of unscrupulous favorites. The murder of his mother, Berenice, and of his brother Magas, shortly after his accession, was due to the machinations of his minister Sosibius, and later he fell under the influence of his mistress Agathoclea and her brother Agathocles, who caused the murder of his wife Arsinoë. In the early part of Philopator's reign Antiochus III seized many of the Egyptian possessions in Syria and in 218 B.C. defeated an Egyptian army sent against him. The following year Ptolemy took the field in person and signally defeated Antiochus at Raphia. Although he allowed his defeated antagonist easy terms, he secured the quiet possession of the Syrian provinces for the rest of his life. Philopator, like most of his family, had strong literary tastes. He wrote a tragedy called *Adonis* and built a temple to Homer as the king of poets. The beautiful temple of Deir-el-Medîneh is his work, and he also built at Assuan, Edfu, and other places.

Ptolemy V (210–181 B.C.), surnamed Epiphanes (the illustrious), who reigned from 205 to 181 B.C., was only five years old when he succeeded his father, Philopator. Antiochus the Great of Syria and Philip V of Macedon took advantage of his minority to seize upon the foreign possessions of Egypt, and Antiochus actually made himself master of Cœle-Syria and Palestine and threatened Egypt itself. Through the intervention of Rome, however, the war was stopped, and Antiochus betrothed his daughter Cleopatra to the young Ptolemy (198 B.C.). Epiphanes was declared of age in 196 B.C., and his coronation was celebrated with unusual splendor. It was on this occasion that the Egyptian priesthood published the decree which forms the inscription on the famous Rosetta Stone (q.v.). In 193 Epiphanes married Cleopatra, and the revenues of Cœle-Syria and Palestine were given as her dowry, but her father garrisoned these provinces with his own troops and they were practically lost to Egypt. In 181 B.C. Epiphanes was poisoned by some of his followers while he was making preparations for a war against Seleucus IV, the son and successor of Antiochus the Great, in order to recover Cœle-Syria.

Ptolemy VI (c.191–181 B.C.), surnamed Eupator, the eldest son of Epiphanes, seems to have reigned for a few months, at most, after his father's death, but nothing is known in regard to him.

Ptolemy VII (c.188–146 B.C.), surnamed Philometor, was the son of Epiphanes and his Syrian wife, Cleopatra, and reigned from 181 to 146 B.C. He was a mere child at the time of his accession, and his mother, a woman of remarkable ability, ruled the country during his minority. She died in 173 B.C., the year of her son's coronation, and a quarrel arose about her dowry. In the war which ensued Antiochus IV invaded Egypt, defeated the Egyptian forces near Pelusium, and had himself proclaimed King at Memphis. The young King was made prisoner, but his brother, afterward Ptolemy IX, gathered an army, assumed the royal title, and successfully defended Alexandria. Antiochus retired to Syria, but soon invaded Egypt again, and would probably have made himself master of the country had not the Roman envoy, M. Popilius Lænas, ordered him back to his Kingdom. The two Ptolemies ruled together until 163 B.C., when they quarreled and Philometor was obliged to flee to Rome for protection. By arrangement the government of Egypt proper was restored to him, and his brother was made King of Cyrene. In 146 B.C. Philometor was killed in battle against the Syrian usurper Alexander Balas.

Ptolemy VIII (c.148–146 B.C.), surnamed Eupator II or Neos Philopator, was the son of Ptolemy VII and, although a child at his father's death, was proclaimed King by his mother. The claim was resisted by his uncle, Ptolemy IX, who marched upon Alexandria with an army, but the dispute was settled by agreement. Ptolemy IX obtained the throne and married his brother's widow, and the young King was murdered after a nominal reign of a few months.

Ptolemy IX (c.184–117 B.C.), surnamed Euergetes II and nicknamed Physcon (fat paunch), is reported by Greek writers to have been a monster of cruelty and licentiousness, but the charges against him seem to have been exaggerated. His reign (146–117 B.C.) was, on the whole, able. His marriage with his brother's widow, Cleopatra, was a political necessity, and not long afterward he married his niece, also named Cleopatra, daughter of Ptolemy VII. In 130 B.C. he was expelled from Egypt by a revolution headed by his wife, the elder Cleopatra, but two years later he returned to Alexandria and resumed the rule of the country. He exhibited great activity in repairing and restoring the temples of Egypt, and maintained the great library of Alexandria in a worthy manner. He possessed some literary ability and wrote a collection of memoirs in 24 books.

Ptolemy X (?–81 B.C.), surnamed Soter II or Lathyrus, was the son of Ptolemy IX. He ruled jointly with his mother, Cleopatra, from 117 to 106 B.C., when he was driven from Egypt by a revolution and took up his abode in Cyprus. Cleopatra, to whose influence his expulsion was due, summoned her younger son, Ptolemy XI, to Egypt and appointed him coregent. In the meantime Ptolemy X made himself master of Cyprus and ruled there until recalled to Egypt in the year 88. The latter part of his reign was marked by a serious rebellion at Thebes which lasted for nearly three years and was put down with great difficulty. He died in 81 B.C. Soter II before his accession to the throne had married his sister, Cleopatra, but was forced by his mother to put her away and marry his younger sister, Selene.

Ptolemy XI (?–88 B.C.), surnamed Alexander I, was the brother of Ptolemy X and was placed on the throne by his mother, Cleopatra, in 106 B.C., after the expulsion of her elder son. In 101 B.C., fearing that his mother was planning his death, he caused her to be murdered. In 88 B.C. he was driven from Egypt by a revolution and was killed in an unsuccessful attack on Cyprus.

Ptolemy XII (c.105–80 B.C.), surnamed Alexander II, was the son of Ptolemy XI by an unknown mother. He was living at Rome at the time of the death of his uncle, Ptolemy X. The latter's daughter, Cleopatra-Berenice, widow of her uncle, Ptolemy XI, and stepmother of Alexander II, succeeded to her father's throne, and Sulla advised Alexander II to marry his stepmother and thus make himself King of Egypt. The marriage was arranged, but when the King and his wife had reigned together for 19 days the Queen was murdered by her husband. This cruel deed so enraged the army that they rose against Alexander II and put him to death. With him the legitimate line of the Ptolemies came to an end.

Ptolemy XIII (c.95–51 b.c.), surnamed Philopator Neos Dionysus and nicknamed Auletes (the piper), was a natural son of Ptolemy X, and after the death of Ptolemy XII possessed himself of the throne without opposition. He reigned from 80 to 51 b.c. He was addicted to every kind of vice and debauchery. He was a skilled performer on the flute and frequently competed for the prize in musical contests with professionals. He maintained friendly relations with Rome; when he died he left his Kingdom to his daughter, Cleopatra, and his elder son, Ptolemy XIV, who was to marry his sister, and appointed the Roman people his executors.

Ptolemy XIV (c.61–47 b.c.), surnamed Dionysus, married his sister, the famous Cleopatra (q.v.), and ruled jointly with her from 51 to 47 b.c., when a dispute arose and the Queen was obliged to leave Egypt. In 47 b.c. Cæsar sent troops to support her cause and Ptolemy was defeated. He was accidentally drowned while trying to escape.

Ptolemy XV (c.58–45 b.c.), the younger son of Auletes, became the nominal husband of his sister Cleopatra in 47 b.c., and was coregent with her for two years, when she murdered him to make room for her son Cæsarion.

Ptolemy XVI (47–30 b.c.), Philopator Philometor Cæsar, called Cæsarion, was the son of Cleopatra by Julius Cæsar and was nominally coregent with his mother from 45 b.c. until her death. After the battle of Actium Cleopatra endeavored to secure his safety by sending him out of the country, but he was betrayed to Octavius, who caused him to be put to death.

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PTOLEMY (Claudius Ptolemæus). An ancient astronomer and geographer. He was a native of Egypt, though it is uncertain whether he was born at Pelusium or at Ptolemais Hermii in the Thebaid. Nothing is known of his personal history except that he flourished in Alexandria in 139 a.d. and there is probable evidence of his having been alive in 161 a.d. Both as an astronomer and as a geographer Ptolemy held supreme sway over the minds of almost all the scientific men from his own time down to the close of the Middle Ages; but, in astronomy especially, he seems to have been not so much an independent investigator as a corrector and improver of the work of his predecessors. In astronomy he had the labors of Hipparchus to guide him, and, indeed, he scrupulously distinguishes between those of Hipparchus and his own. To Ptolemy belongs the invention of a planetary theory, the discovery of the moon's evection (q.v.), and the singular distinction of being the sole existing authority on the subject of ancient astronomy. From this last-mentioned fact the system of astronomy which he sets forth in the *Μεγάλη Σύνταξις τῆς 'Αστρονομίας*, commonly known by the mediæval title *Almagest* (q.v.), received his name and, as the Ptolemaic system (q.v.), obtained the homage of succeeding generations till the time of Copernicus.

The *Almagest* is divided into 13 books, and the trigonometry of the Greeks is known almost entirely through this work of the second century. It shows that the Greeks were then confined to the sexagesimal system and used tables of whole chords instead of half chords. Book i contains all that can be regarded as pure theory. The further mathematical work of the *Almagest* consists of applications of the geometry and trigonometry of Book i.

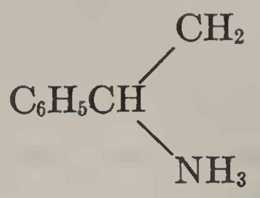
As a geographer Ptolemy appears as the corrector and improver of the works of a predecessor, Marinus of Tyre, about whom, except from Ptolemy's writings, little is known. His *Γεωγραφικὴ 'Υφήγησις* is divided into eight books, all of which, with the exception of the first, eighth, and a portion of the seventh, are nothing more than a catalogue of places, with their latitude and longitude (to twelfths of a degree), with a brief general description prefixed to each continent and country or tribe, and interspersed here and there with remarks of a miscellaneous character on any point of interest. The rest of the work contains details regarding his mode of noting the positions of places, by latitude (*μῆκος*) and longitude (*πλάτος*), with the calculation of the size of the sphere of the earth and of the extent of surface then known. He also describes the mode adopted by him of projecting the surface of a hemisphere on a flat surface, and shows its superiority over the projections of Eratosthenes, Hipparchus, and Marinus. He constructed a series of 26 maps, together with a general map of the world, in illustration of his work.

The chief of his writings, besides those already mentioned, are: *Τετράβιβλος Σύνταξις*, with which is combined another work, called *Karpos* or *Centiloquium*, from its containing 100 aphorisms, both works treating of astrological subjects and held by some on this account to be of doubtful genuineness; *Φάσεις 'Απλανῶν 'Αστέρων καὶ Συναγωγὴ 'Επισημασειῶν*, a treatise on the phenomena of the fixed stars, or a species of almanac. The rest of his works are of inferior importance and consist of descriptions of various kinds of projections (q.v.), the theory of the musical scale, chronological and metaphysical treatises, and a summary of the hypotheses employed in his great work, the *Almagest.* Others of Ptolemy's works have been lost, and it is still a moot point whether or not they contained a treatise on optics, as a Latin version of what is said to have been an Arabic translation of Ptolemy's original treatise on that subject is still in existence.

The *Almagest* and the *Geography* were the standard textbooks to succeeding ages, the first till the time of Copernicus, the second till the great maritime discoveries of the fifteenth century showed its deficiencies. They have passed through numerous editions, the best of which are, for the *Almagest* and most of Ptolemy's minor works, those by Halma (Paris, 1813–20) and by Heiberg (2 vols. in 3 parts, Leipzig, 1898–1907). Of the *Geography* the principal early editions are the Latin versions of 1482 and 1490, published at Rome, the editio princeps of the Greek text by Erasmus (Basel, 1533), and the Elzevir edition (Leyden, 1619). The best modern editions are that of C. F. A. Nobbe (3 vols., Leipzig, 1843) and the annotated edition (not yet complete) by Carl Müller and C. T. Fischer, contained in Didot's *Bibliotheca Græcorum Scriptorum* (vol. i, 2 parts, Paris, 1883, 1901). The catalogue of stars has been frequently reprinted separately, the last and best edition being that of Francis Baily, vol. xiii of the *Memoirs of the Royal Astronomical Society* (London, 1843). Consult: J. B. J. Delambre, *Histoire de l'astronomie ancienne* (vol. ii, Paris, 1819); P. Tannery, *Recherches sur l'histoire de l'astronomie ancienne* (ib., 1893); T. G. Rylands, *Geography of Ptolemy Elucidated* (Dublin, 1893).

PTOMAINE (tō′mȧ-ĭn; *colloq.* tō′mān) **POISONING.** A severe gastrointestinal toxæmia caused by eating decomposed food. Ptomaines are basic, nitrogenous compounds, akin to alkaloids, produced by the action of bacteria on organic matter. Not all ptomaines are poisonous and each ptomaine is derived from the vital activity of a particular microörganism. Ptomaine poisoning is always brought on by the ingestion of contaminated food and is manifested by severe gastrointestinal irritation and profound prostration. The patient suffers from chilliness, headache, vertigo, extreme thirst, and abdominal and muscular pains; vomiting and purging show nature's attempts to rid the system of the offending material; and in very severe or fatal cases twitching of the muscles, ocular disturbances, dyspnœa, convulsions, and coma supervene before death. The treatment is to empty the gastrointestinal tract by the use of the stomach tube and by bowel irrigations, if nature has not already done this. Pain is controlled preferably by morphine, and in threatened collapse stimulation is secured by the application of heat to the abdomen and extremities, by giving whisky, or by administering atropine by hypodermic injection. The acute symptoms having passed, castor oil and intestinal antiseptics are given to keep the bowels empty and to limit bacterial growth. *Botulism* (q.v.) is a distinct type of meat poisoning which follows the eating of decomposing sausage, spoiled canned meats, and similar products.

PTOMAINES, tō′mȧ-ĭnz; *colloq.* tō′mānz (from Gk. πτῶμα, *ptōma*, corpse, from πίπτειν, *piptein*, to fall; connected with πέτεσθαι, *petesthai*, to fly, Lat. *petere*, to attack, seek, Skt. *pat*, to fly, fall). A name applied to a class of poisonous organic substances of animal origin, extremely similar in their chemical and physical properties and physiological action to the vegetable alkaloids. The effects that often follow from using bad fish or canned meat are probably due to the action of ptomaines. There is also increasing evidence that the symptoms of many diseases are caused, not by the specific microörganisms themselves, but by the ptomaines produced by them, as, e.g., the typhotoxine produced by typhoid bacilli. Chemically the ptomaines are amines; i.e., they contain one or more NH_2 groups attached to hydrocarbon radicals. Following are a few of the more important ptomaines known:

Isophenylethylamine,  $C_6H_5CH\begin{smallmatrix}CH_2\\NH_3\end{smallmatrix}$,

one of the products of the pancreatic putrefaction of gelatin, was isolated by Nencki in 1876.

Cadaverine, penta-methylene-diamine, $NH_2(CH_2)_5NH_2$, is found in corpses during the earlier stages of putrefactive decomposition; it is a liquid solidifying to a crystalline mass at low temperatures and forming crystalline compounds with acids and with certain salts.

Putrescine, tetra-methylene-diamine, $NH_2(CH_2)_4NH_2$, is found in considerable quantities in putrid herrings and in corpses during the later stages of putrefactive decomposition; it is, like cadaverine, a liquid crystallizing in the cold and combining with acids and certain salts to form crystalline compounds.

Choline, trimethyl-oxyethyl-ammonium hydroxide, $(CH_3)_3N(OH)CH_2CH_2OH$, is found among the products of decomposition of pig's or ox bile; it is a thick, colorless liquid readily decomposing if mixed with water and heated; it acts as a strong base, forming deliquescent salts with acid and also crystalline compounds with certain salts. It may be prepared from the yolk of eggs by decomposing the lecithin of the latter as follows: the yolk is carefully extracted with alcohol and ether and the residue is boiled with caustic baryta; on precipitating the barium with carbonic acid and filtering, the solution is evaporated and the residue extracted with absolute alcohol, from which the choline is precipitated in the form of its platinum-chloride salt and the latter is decomposed with sulphureted hydrogen. Wurtz succeeded in preparing choline synthetically.

Neurine, trimethyl-vinyl-ammonium hydroxide, $(CH_3)_3N(OH)CH=CH_2$, is chemically similar to choline, from which it may be prepared; it is a highly poisonous liquid ptomaine, forming crystalline compounds with acids and with certain salts; it is a common product of the putrefaction of meat.

PTOSIS, tō′sĭs (Neo-Lat., from Gk. πτῶσις, fall, from πίπτειν, *piptein*, to fall). A falling; a prolapse. Ptosis is the term commonly used of a falling of the eyelid. (See Eye, Diseases of the.) Enteroptosis is a prolapse of the intestines into a lower plane than normal, owing to laxity of the abdominal walls. Gastroptosis is a falling of the stomach, which occurs in cases of retention of food in that organ, whereby it is weighted heavily, and also in cases in which the walls of the viscus are weak.

PTYALIN, tī′ȧ-lĭn. See Diastase.

PTY′ALISM. See Horse, *Diseases of the Horse;* Salivation.

PU′BERTY (Lat. *pubertas*, from *puber*, *pubes*, mature). The period of human life at which the generative organs of the male or female become capable of exercising the function of reproduction. The term is applied also to the changes in the special organs and the general system that accompany the onset of this period. Sexual maturity is reached earlier in warm climates than in cold or temperate ones. The age at which puberty is established in temperate zones is, in males, between 14 and 16; in females, between 13 and 15; but it cannot be reckoned by age alone, and is influenced by national or hereditary peculiarities and by some diseases. The changes noted in the male at puberty are a development of the larynx with the breaking and deepening of the voice; a growth of hair about the face, pubes, and other parts of the body; the fuller development of the sexual apparatus, with secretion of the seminal and accessory fluids; and finally the appearance of sexual instincts and inclinations. In the female physical and functional maturity are almost contemporaneous, and functional womanhood ceases suddenly at the menopause or climacteric. The change most characteristic of puberty in the female is the appearance of the menses, but besides this there are development of the breasts, ovaries, uterus, and external genital organs, and changes in the bony pelvis. In both sexes there is a rapid increase in size and weight. See ADOLESCENCE, and references there given.

PUB′LICA′NI (Lat., men concerned with the *publicum*, the state and its interests, especially the taxes, and so taxgatherers). In ancient Rome, the farmers of the public revenues (*vectigalia*). These revenues were put up at auction by the censors (see CENSOR) and were sold for a period of five years. They were derived chiefly from tolls, tithes, harbor duties, *scriptura* (the tax paid for the use of public pasture lands), mining and salt duties. As the state required the publicani to give security for the sum at which they had purchased the right to collect the taxes, and as this sum was usually much greater than the wealth of any single individual, companies were formed, the members of which were enabled to carry on conjointly undertakings far beyond the capabilities of the separate shareholders. Their contract with the Roman government was made in the name of a single person, who was called *manceps* and who was held responsible for his *socii* (fellow members) to the state. Only Roman citizens could serve as publicani. As in France before the Revolution, the farming of revenues resulted in great injustice and peculation, especially in outlying provinces; and the publicans were a bitterly hated class, as appears in numerous passages of the New Testament. Consult: Cicero, *De Imperio Gnæi Pompei*, passim; Livy, xxiii 48 ff.; the article "Publicani," in William Smith, *A Dictionary of Greek and Roman Antiquities*, vol. ii (3d ed., London, 1891); A. H. J. Greenidge, *Roman Public Life* (ib., 1901).

PUBLIC BATHS. See BATH HOUSES, MUNICIPAL.

PUBLIC CALLING. Any trade or calling carried on by a private individual or private corporation which, because of its quasi-public character, has certain privileges as well as legal obligations which do not attach to an ordinary private trade or calling. The business of common carriers and that of innkeepers are examples of public callings. The essential characteristics of public callings are that those engaged in them hold themselves out as engaged in the business of serving the public indiscriminately.

From the earliest time the common law held that the businesses carried on by common carriers, innkeepers, truckmen, ferrymen, bakers, millers, and wharfingers were, or under proper conditions might be, public callings. And in later times the courts have held that the businesses of telegraph and telephone companies, elevator companies, and warehousemen were public callings. In general it may be said that all who engage in a public calling must serve the public without discrimination for reasonable compensation and with a high degree of care for the persons and property of those who engage their services. This rule, however, is subject to the limitation that the person claiming the public service must be a proper person to receive it. Those engaged in public callings in return for their obligation to serve all persons properly entitled to service have the compensating advantage that they either have a lien for their services or may claim payment or compensation in advance. They also have the right to make and enforce reasonable regulations governing the conduct of their business.

When a business is affected with a public interest and thus becomes a public calling, it ceases to be *juris privati* only and is subject, within reasonable limits, to the right of the state to regulate it. See CARRIER, COMMON; CONSTITUTIONAL LAW; INNKEEPER.

PUBLIC COMFORT STATIONS. These conveniences, including lavatories and water closets, have long been numerous in European cities and are gradually being provided in American cities. In Europe a slight charge is usually made for their use, though in many cases they are absolutely free. Boston, New York, and San Francisco were the first American cities to have public comfort stations.

Consult: "Public Baths and Water-Closets" in M. N. Baker, *Municipal Engineering and Sanitation* (New York, 1902); also the report on *Public Baths and Public Comfort Stations* (ib., 1897), and *Comfort Stations in New York City and elsewhere*, published by the New York Association for Improving the Condition of the Poor (ib., 1914).

PUBLIC DOMAIN OF THE UNITED STATES. For a discussion of the surveys made upon the national domain, see SURVEYING. See also ALASKA, *History;* LANDS, PUBLIC.

PUBLIC FUND. In the United States, the money in the hands of an officer or department of the government to be employed for governmental purposes. Public funds are raised by taxation in various forms and the accumulation of public revenues from any source. A State treasurer may have the public money credited to different funds, as the school fund, etc., and usually has no authority to transfer money from a fund raised for a certain purpose to another fund to be employed for an entirely different purpose.

In England public funds are funded securities, such as consols, annuities, etc., which are guaranteed by the government. See TAX, and the authorities there referred to.

PUBLIC HEALTH SERVICE. A bureau in the Treasury Department of the United States, formerly called the Marine Hospital Service. It is charged with the management of marine hospitals and relief stations for the cure of sick and disabled seamen of the American merchant marine. It has also under its supervision the national quarantine stations, the supervision of local quarantines, the investigation and suppression of epidemics and plagues, the collection and dissemination of mortality statistics and sanitary information, the scientific investigation of sanitary problems, and the examination of immigrants under the laws excluding those affected with contagious diseases. In 1913 the service distributed 1,487,015 pieces of health literature of a popular character. In 1914 there were 23 marine hospitals, a sanitarium for consumptive seamen in New Mexico, and 120 relief stations. The Public Health Service of the United States owes its origin to an Act of Congress of July 16, 1798. For a long time the service consisted mainly of independent hospitals built as necessity arose and placed under charge of a surgeon appointed by the Secretary of the Treasury. In 1871 the service was reorganized and placed under the charge of a supervising surgeon-general with an office in Washington. In 1914 the commissioned corps consisted of the surgeon-general, 10 senior surgeons, 66 surgeons, 43 passed assistant surgeons, and 47 assistant surgeons. There were, besides, 239 acting assistant surgeons appointed by the Secretary of the Treasury. The marine hospitals are located on both the Atlantic and Pacific seaboards, on the Gulf of Mexico, on the Great Lakes, in several of the larger river cities, and in Alaska, while relief stations exist in the new insular possessions. Consult the annual reports and public addresses of the surgeon-general.

PUBLIC LANDS. See LANDS, PUBLIC.

PUBLIC LAW. That branch of the law which defines and protects the rights which subsist between state and subject, as distinguished from that which deals with the rights that subsist between subject and subject. In public law the state, which defines and protects the right, is a party interested in or affected by the right and may therefore uphold or extinguish it. The conception of public as opposed to private law is due to the Roman jurisprudence, in which the law of crime was included under the same head. The civil law of the continent of Europe retains the same classification.

The topics under which public law is most commonly treated are: constitutional law, or that which defines the form of government and the powers of the several departments thereof; administrative law, or that branch which prescribes the manner in which the various political powers of the state shall be exercised within the constitution; criminal law, or that branch which contains the rules concerning injuries to the government or to the public at large and disobedience to the rules laid down for the common welfare, and the penalties to be inflicted for violations of the same; and criminal procedure. Besides these usual subdivisions of public law two other important divisions have been made comprising the rights and duties of the state as a juristic or artificial person against or in favor of natural persons, and the body of law prescribing the mode in which the state may sue and be sued. These rights of the state are irrespective of and in addition to those which belong to the right of eminent domain and are those which govern it, as, e.g., a landed proprietor, the owner of personal property used in or about public buildings or of manufacturing establishments, a contractor in engineering operation, a banker issuing promissory notes, a legatee under a will, etc. Its rights and liabilities under many of these heads are different from those of individuals or other artificial persons, especially with reference to liabilities for injuries done by its servants and as to the barring of its rights by prescription. The procedure provided for when the state is a party is not essentially the same for both the parties, as in private law, but is relatively abnormal and takes different forms according to whether the suit is against the subject by the state, or vice versa.

See JURISPRUDENCE; LAW; and for a discussion of the various branches of public law, see ADMINISTRATIVE LAW; CONSTITUTIONAL LAW; COURT; CRIMINAL LAW; PLEADING; PROCEDURE; ETC., and consult the authorities referred to under those titles.

PUBLIC'OLA, PUBLIUS VALERIUS (?–503 B.C.). A Roman consul, described by Livy and Plutarch as a magnanimous patriot. He bore a chief part in expelling the Tarquins. After the death of his colleague, Junius Brutus, having heard of the suspicions of the people that he was aiming at a despotic power, he demolished in the night a palatial edifice which he had reared and ordered that the fasces which were carried before him as the emblem of power should be lowered when he came before the people. By his efforts stringent laws were enacted to protect the liberties of the citizens. The surname of *Publicola,* or, in its older form, *Poplicola* (friend of the people), was conferred upon him and his descendants. He was thrice elected consul.

PUBLIC POLICY. In general, those considerations of public interest and morality which the community enforces by legislation or judicial action. In this sense of the term is found the justification for that great body of modern legislation, of which the Sherman Antitrust Law and the laws restricting hours of labor and conditions of industry may be taken as illustrations, in which the freedom of action of the individual is restrained in the public interest. The term is, however, more commonly employed in English and American law in a more restricted sense, as the ground or basis for refusing to enforce certain classes of contracts, as contracts in restraint of trade, gambling contracts, usurious agreements, and the like. The earliest trace of this principle in English law reports is found in a case decided in the second year of the reign of Henry V (1414). A dyer had contracted not to use his art within a certain town for six months. He did, in fact, practice his calling there within the time limit and was sued for breach of his contract. When the case came before the court, Mr. Justice Hull is reported to have been uncommonly angry at the plaintiff for daring to restrain the liberty of the defendant. He went upon the principle that it was not good for the realm—that it was against public policy—for men to bind themselves not to exercise their trade. Two hundred years later Mr. Justice Anderson cited this decision in holding a similar contract void, declaring such a contract to be "against the law, against the liberty of the freeman, and against the commonwealth." About the same time a contract by a landowner that he would not sow his land for a certain period was adjudged void as "tending to the inconvenience and prejudice of the state." The principle announced in these early cases has never since been repudiated, although its application to particular contracts in *restraint of trade* (q.v.) has varied with changing business conditions and public opinion.

Contracts promotive of immorality have always been deemed subversive of public policy and hence void. Agreements in restraint of marriage, wagers that one will not marry, and marriage brokerage contracts, or agreements to bring about the marriage of a particular person, have been held void because against sound public policy. This principle has been applied, also, in avoiding agreements for the sale of offices and for the assignment of officers' salaries, as tending to injure the public service; in avoiding agreements with an alien enemy as well as those which are hostile to a friendly country, such contracts having a tendency either to harm our country directly or to embroil us with other nations. Most frequently of all, perhaps, it is applied in avoiding contracts for the stifling of criminal prosecutions, or the perversion of justice in civil suits, or for services in lobbying with legislators, or improperly influencing administrative officers. Combinations between business houses or corporations entered into for the purpose of preventing honest competition or the creation of monopolies are void as against public policy. Consult: Elisha Greenhood, *Doctrine of Public Policy in the Law of Contracts* (Chicago, 1886); Sir Frederick Pollock, *Principles of Contracts* (London, 1902); Sir W. R. Anson, *Principles of the English Law of Contract* (12th ed., Oxford, 1910).

PUBLIC RECORD OFFICE. See RECORDS, PUBLIC.

PUBLIC RECORDS. See RECORDS, PUBLIC.

PUBLIC SCHOOLS. A term usually applied in the United States to the institutions maintained at public expense for the formal education of children. The idea of organizing schools where rich and poor might obtain efficient free instruction did not take firm root in the minds of the people of the several States until the early part of the nineteenth century, although even the earliest settlers of the Colonies were not unmindful of their duty with respect to the education of the young. In 1647 a law was passed in Massachusetts requiring every town of 50 householders to maintain a master to teach reading and writing, and every town of 100 householders to maintain a grammar school, the wages of such master to be paid by parents whose children took advantage of the instruction. A somewhat similar law was passed in Connecticut in 1650. In most of the New England Colonies education was considered a public responsibility. New York, on the contrary, owing to the wrangling between the Dutch and the English, was rather late in recognizing the necessity for a public-school system; comparatively little attention, in fact, having been paid to the subject before the close of the Revolution. The same is true of Pennsylvania, which depended mostly on private benefactions for the establishment of schools. New Jersey, on the other hand, passed a law in 1693 looking to the establishment of schools. In the South there were no school systems previous to the Revolution. What was done in the way of education was chiefly the result of private enterprise. The four decades following the Revolution form the transitional period. Local autonomy gradually gave way to centralization and State supervision, this process varying, of course, with local conditions. From the very beginning the Federal government was doing much by means of land grants and other aid to encourage the several States in the establishment of school systems, setting aside in 1785 and 1787 one thirty-sixth of all the public land in the several States for school purposes. In 1795, at the instance of Governor Clinton, a law was enacted in New York providing for local school supervision, and in 1812 the office of State Superintendent of Common Schools was created, Gideon Hawley holding it until 1821, when the office was unfortunately abolished and the Secretary of State was nominally left to carry out the duties of superintending schools. It was not until 1854 that the office was revived. In Massachusetts the Board of Education was organized in 1837 and the various school organizations were united and correlated, the moving spirit in this work being Horace Mann (q.v.). The other States followed the example of New York and Massachusetts. Connecticut and Rhode Island found a leader in Henry Barnard. In this successful movement for public schools no little credit is to be assigned to the efforts of the various educational associations, particularly the National Education Association.

The three main types of public schools in the United States are: (1) the city elementary and high schools; (2) the town union school, which includes a high-school department; (3) the district school, so called from its usually being established in certain rural districts and offering elementary instruction. As a rule, little attention is paid to grading in these district schools. The general tendency is growing now towards the establishment of public institutions for dependent children, truants, and incorrigibles, where, in connection with industrial training, the elementary branches are taught. In 1912 the attendance of the elementary schools was about 17,077,577, about 1,505,637 attending private schools. The term "public schools" is anomalously used in England to denote the several famous preparatory schools, as Eton, Harrow, and Rugby (q.v.). For details of the various systems of public instruction in the United States and the principal European countries, see COMMON SCHOOLS; EDUCATION; EVENING SCHOOLS; GRAMMAR SCHOOLS; NATIONAL EDUCATION, SYSTEMS OF; SCHOOLS.

PUBLIC SERVICE, PUBLIC SERVICE COMMISSIONS. See PUBLIC UTILITIES, REGULATION OF.

PUBLIC UTILITIES, REGULATION OF. Since 1900 the term "public utilities" has come into wide use to denote either a service or a servant which supplies for profit certain common wants of the public. The service rendered is of the common-carrier type and requires the use of more or less specific routes by land, water, or air. This makes or tends to make the service a natural monopoly. The servant, whether an individual, a private corporation, or a public or governmental corporation acting in a private capacity, exists and operates under direct or implied governmental grants of power. Besides control through the police power, public utilities are subject to a wide range of government regulation because they are creatures of the State and also because their actions vitally affect the public welfare at many points, such as notably the character of service rendered, the fairness of the rates charged, and the safety of public-utility securities as investments. Included in the utilities now subject to regulation in many States are steam and electric railways, water transportation lines, express service, the telegraph and telephone, light, heat, and power in various forms, and public water supply. The tendency still is to increase the list.

While there has been some regulation of public utilities or services ever since they came into existence, anything like effective control was rare indeed until well towards the close of the nineteenth century, and even that was limited to the railroads engaged in interstate commerce or operating within one or two States, and to the gas and electric light service in the single State of Massachusetts. This condition of little or no effective public control of utilities was naturally incident to a rapidly developing country more intent on getting public utilities than on regulating them. The early regulation was chiefly a paper or potential but unused control through legislative provisions of charters, franchises, and contracts, unaccompanied by any means of enforcement except through the slow and uncertain action of the courts—an agency legally but not practically open to all. To make good these deficiencies, reliance was for a long time placed in still more legislation. Where this legislation was general in character, it usually failed through lack of provision for its enforcement, and where the legislatures attempted to deal with the specific abuses of single companies, their knowledge and time alike were too limited to cover more than a few cases a year. Gradually the necessity for administrative bodies charged with the enforcement of specific laws or themselves endowed with regulatory and judicial powers became evident. It was a long time before these bodies were given power to do more than investigate and advise. In 1915, however, the Interstate Commerce Commission as regards interstate railroads, Pullman, express, water-transportation, and telegraph and telephone companies, and many State commissions as regards these and other public utilities within their own borders, had a large measure of public control, while every State in the Union except Delaware and Utah exercised some degree of regulation by public-utility or public-service commission. As a rule, full power of review of State utility commission orders is vested in the courts, but in practice the major part of the decisions of the commissions are final—the main exceptions centring around constitutional provisions against taking property without compensation or without due process of law.

Aside from more or less superficial commission control of railways extending backward for many decades, public-utility regulation in the United States dates from the establishment of the Massachusetts Gas and Electric Light Commission in 1885 and the Interstate Commerce Commission in 1887. Both commissions had relatively little power at the outset, but were materially strengthened before the close of the century. Meanwhile and up to 1907 numerous railway commissions had been created, some of which were vested with considerable regulatory power. The first public-utility commissions of wide scope and power dated from the enlargement of the powers and duties of the Wisconsin Railroad Commission, and the establishment of the public-service commissions (first and second districts) of New York State, both in 1907, under the leadership of Governor La Follette and Governor Hughes respectively.

The example set by these two States and the success attained by their commissions led other States to create new commissions or to enlarge the powers of old ones. It should also be noted that from the nineties on many cities tried more or less effectively to regulate the public utilities which served their citizens. Rarely did these attempts go beyond franchises or contract provisions. As a rule, the only means of enforcing these provisions were court actions, which of course could not go beyond the specific provisions of the franchises or contracts. In California (see close of article) and Iowa cities were long ago empowered to fix rates charged for water and light, and in a very few cities local public-utility commissions have been established. Public utilities under municipal ownership are often in sore need of regulation to insure good service and fair rates. Massachusetts and Wisconsin are the chief, if not the only, examples of State regulation of municipally owned utilities, except that many of the States exercise considerable control of the purity of city water supplies regardless of whether these supplies are publicly or privately owned.

In few if any of the States has the regulation of all public utilities been reduced to a thoroughly consistent basis with the elimination of overlapping and conflicting jurisdictions. For example, in some of the States with the strongest public-utility commissions, water works may be subject to regulation by a public-utility commission as regards capitalization, rates and character of service, by the State board or department of health in the matter of purity of the supply, and by a State water-supply or conservation commission as regards water rights and the rival claims of two or more municipalities to the same source of supply. Beyond this there may be still further control of municipal water works in the matter of uniform accounts and reports through a State department of municipal audit.

In some parts of the country there has been strong objection to State regulation of public utilities on the ground that it is against the municipal home-rule principle of which so much has been made in recent years. This objection cannot hold good except where the very extreme of the municipal home-rule principle is admitted as valid. So long as the State remains sovereign over municipalities it is bound to exercise a greater or less degree of control over local services, whether these are rendered by private corporations or the municipality itself. Reason and experience both point to the superiority of State administrative rather than State legislative control of local affairs, once the governing policy has been determined by the legislative body. There is therefore not only less interference, but such interference as arises is of a less irritating character, when exercised by a body of trained administrators far more permanent in character than a State legislature and more likely to follow a consistent policy. Another and strong argument for utility control through the State rather than the municipality is that only a few of the very large cities can command the necessary engineering, legal, and administrative staff for effective control, whereas this can be done readily by a State commission, which at the same time accumulates many valuable data and a broad and varied experience, both of which are essential for efficient regulation.

In general, the State utility commissions have a small membership appointed by the Governor and confirmed by the Senate. The commissions are provided with engineering, legal, and clerical staffs, the members of which are, or soon become, experts in their respective lines. A large part of the work of the commissions consists of adjusting utility rates. This involves extensive investigations to determine the legitimate capital investment, or at least to establish a valuation on which a fair rate of earnings shall be allowed. In the fixing of rates for such services as water supply and lighting it is necessary to go into careful studies of the relative investment and operating costs and the service rendered to private consumers and to the public at large. One of the most important functions of some utility commissions is to govern the issue of securities by public-service corporations in order to safeguard the investing public and to prevent unduly high charges to consumers for service rendered on the ground that the companies have to earn a fair return on their capitalization.

Interstate Commerce Commission. The Interstate Commerce Act of 1887 was passed under the leadership of Representative Reagan, of Texas, and Senator Cullom, of Illinois. The influence of this and later Federal control of railways on subsequent general utility regulation is manifested by the resemblance of the various pieces of State legislation to the Federal acts. The Act of 1887 prohibited unjust and unreasonable charges, rebates, and discriminations by the railroads and required public files of rates and detailed financial reports. Greater charges for short haul than for a long one over the same line were interdicted. The orders of the commission were to be enforced by the Federal courts.

In 1890 the Supreme Court upheld the right of witnesses to refuse to testify in the absence of immunity from prosecution. Congress promptly amended the law, and in 1896 the court upheld the revised statute. In 1897 the Supreme Court ruled that the commission could not fix rates in the absence of unmistakable delegation of this function by Congress. In the same year the Supreme Court killed the long-and-short-haul section of the Interstate Commerce Act by denying the right of the commission to establish the relative reasonableness of rates between cities.

Under the leadership of President Roosevelt the powers of the commission were restored to their original height. An Act of 1906 conferred upon the commission the power to determine and prescribe fair rates and regulations. Power to suspend the commission's orders was lodged in the United States circuit courts, with appeals going directly to the Supreme Court, and the burden of proof was put upon the railroads. Passes were cut off; transportation companies were compelled to give up allied businesses, like coal mining. Standardized operating and financial reports were required from the roads. In 1910 the commission was authorized to suspend rate increases prior to their taking effect and pending determination of their reasonableness. The determinations of mere fact by the commission were removed from review of the courts and a special court established to review appealed orders. The long-and-short-haul clause was reëstablished. The authority of the commission was extended to cover telegraph, telephone, and cable companies and to institute inquiries on its own initiative. The duties imposed upon the Interstate Commission have continually increased in scope. The enforcement of the Safety Appliances Act of 1893 was given to it. This statute required drive-wheel power brakes and train-brake control apparatus on all locomotives; trains were required to have enough power-braked cars to give the engineman control of train speeds; cars were required to have automatic couplers. In 1910 running boards were specified for freight cars, all common carriers were required to report accidents monthly, and the commission was given authority to investigate accidents thus reported. In 1911 safe and inspected locomotive boilers were required.

State Regulation. Massachusetts, Wisconsin, and New York have led the way in efficient State regulation. The Massachusetts regulation is a growth of many years. It vests control of gas and electric light service, both private and municipal, in a Gas and Electric Light Commission; steam and street railways, steamship lines, and all other common carriers, in the Railroad Commission; telephone and telegraph companies in the Highway Commission; and a limited control of water-supply utilities in the State Board of Health. New York has two public-service commissions. The one for the first district is confined to New York City, and, besides regulating all privately owned public utilities (except the telephone and the telegraph), the commission is charged with the building of a vast subway system, inheriting this task from the Rapid Transit Commission. The commission for the second district controls utility companies outside of New York City and telephone and telegraph service throughout the entire State. The Wisconsin laws will next be summarized, because Wisconsin was the pioneer in comprehensive scientific public-utility control and because its laws are still typical of the advanced regulation of the whole country.

WISCONSIN LEGISLATION

Commission. The Railroad Commission, consisting of three commissioners appointed by the Governor for six years, has jurisdiction over all railways and common carriers, light, power, heat, gas, telephone, telegraph, and water companies, and similar municipal departments. The commission also administers the State Dam Act, governing the development of navigable waters, water powers, and the construction, maintenance, and use of dams.

Expenses. Salaries and expenses are paid by the State, but the expenses of cases are assessed on companies adjudged to be giving unreasonable rates, inadequate service, or undue preference. There are fees for authorizing bonds, notes, etc.

Rates. All utility charges must be just and reasonable; the commission must consider fair return on property used and useful and must provide for depreciation. Dividing scales are permitted to divide excess profits and encourage efficiency. The commission may order joint service and fix joint rates for common carriers, street railways, and telephone and telegraph utilities. It may temporarily suspend, amend, or alter railway rates for the public good in emergencies. On complaint it may suspend rates pending investigation. All rates fixed by the commission are prima facie reasonable until changed.

Discrimination. No railroad or public utility may discriminate in charges for like or contemporaneous service. Railways may handle freight free for governments, charities, fairs, expositions, and for its own and other railways' employees and may give free or reduced fares to ministers, college agents, charity bureaus, officials, land agents, and to its own and other roads' employees, but to no public officer. No private or municipal utility may give any political committee or public officer or officer elect any free service.

and standards for securing accuracy of all utility meters and may provide for the testing of all meters. Any consumer may have his meter tested at a reasonable fee, to be paid by the utility company if the meter is too fast.

Safety. Before being put in operation each new railroad or extension must be examined and approved by the commission. The commission may establish rules and specifications for the installation and use of safety appliances. Every railroad must report service accidents resulting in injury to persons or property, and every other utility must give notice of accidents resulting in loss of life. The commission may investigate any accident.

Accounts. The commission may prescribe uniform accounts for railways, common car-

SUMMARY OF PUBLIC UTILITY COMMISSIONS

(From the New York *Evening Post*, of March 31, 1915)

COMMISSIONS HAVING FULL JURISDICTION OVER ALL PUBLIC UTILITIES

STATE	Title	Years of formation	Scope of power
Arizona	Corporation Commission	1891–1912	C
California	Railroad Commission of the State of	1876–1911	C
Connecticut	Public Utilities Commission	1853–1911	
District of Columbia	Public Utilities Commission of the	1913	C
Georgia	Railroad Commission of	1879–1907	C
Idaho	Public Utilities Commission	1913	
Illinois	Public Utilities Commission of	1871–1914	C
Indiana	Public Service Commission of	1905–1913	C
Maryland	Public Service Commission	1910	C
Massachusetts	Public Service Commission	1869–1913	C
Massachusetts	Board of Gas and Electric Light Commissioners	1885–1902	C
Michigan	Railroad Commission	1873–1913	C
Missouri	Public Service Commission	1875–1913	C
Montana	Railroad Commission of	1907–1913	
Nevada	Public Service Commission (electric railways excluded)	1907–1911	
New Hampshire	Public Service Commission	1844–1911	C
New Jersey	Board of Public Utility Commissioners for the State of	1911	C
New York	Public Service Commissioners (1st and 2d districts)	1855–1907	C
Ohio	Public Utilities Commission of	1867–1911	C
Oklahoma	Corporation Commission of	1908	
Oregon	Railroad Commission of	1887–1912	
Pennsylvania	Public Service Commission of Commonwealth of	1907–1914	C
Rhode Island	Public Utilities Commission	1844–1912	
Vermont	Public Service Commission	1855–1908	C
Washington	The Public Service Commission of	1905–1911	
West Virginia	Public Service Commission	1913	
Wisconsin	Railroad Commission of	1874–1907	C

COMMISSIONS EXERCISING JURISDICTION OVER RATES AND SERVICE OF TRANSPORTATION COMPANIES AND IN SOME CASES OVER OTHER UTILITIES

STATE	Title	Years of formation	Scope of power
Alabama	Railroad Commissions	1881–1907	I T
Arkansas	Railroad Commission of	1899	
Colorado†	Railroad Commission of	1885–1913	I
Florida	Railroad Commissioners for the State of	1887–1906	T
Iowa*	Board of Railroad Commissioners	1878–1897	I
Kansas*	Public Utilities Commission	1883–1911	I C
Louisiana*	Railroad Commission of	1898	T
Maine†	Railroad Commission of	1858–1913	R
Minnesota	Railroad and Warehouse Commissioners	1871–1905	
Mississippi	Railroad Commission	1884–1906	T
Nebraska	State Railway Commission	1885–1909	T C R
New Mexico	State Corporation Commission of	1910–1912	T R
North Carolina	Corporation Commission	1891–1908	T R
North Dakota	Commissioners of Railroads	1885–1905	T
South Carolina	Railroad Commission	1878–1910	T R
South Dakota	Railroad Commission	1885–1911	T
Texas	Railroad Commission of	1891–1897	C
Virginia	State Corporation Commission	1877–1904	T R L
Wyoming	Public Service Commission	1915	

COMMISSIONS EXERCISING LIMITED SUPERVISION OVER CARRIERS ONLY

STATE	Title	Years of formation	Scope of power
Kentucky	Railroad Commission	1880–1909	
Tennessee	Railroad Commission	1883–1897	

STATES HAVING NO COMMISSIONS

Delaware Utah

* Outside corporate limits only. † Modern utility law awaiting referendum (capitalization to be controlled).
I indicates interurban railways. R indicates street railways. T indicates telegraph and telephone systems.
L indicates lighting companies (electric and gas). C indicates control of capitalization.

Service. Every public utility is required to furnish adequate facilities and service. Every utility is required on reasonable compensation to permit the use of fixed equipment on, over, or under streets and highways by any other utility where such use does not result in irreparable damage.

Meters. The commission may establish rules riers, and utilities. No concern may keep any books not prescribed by the commission.

Certificate of Convenience. Before any railway may exercise its powers or begin construction the commission may make surveys and examinations and enter on any lands to select the best route. If a certificate is refused, application may be made after two years. The company may appeal to the Circuit Court. Before work is started the road must file specifications of construction, which the commission may change or approve.

Municipalities, Powers. Every municipal council has power to determine the quality, character, and extensions of utility service to be rendered within its own limits, and the terms and conditions under which utilities may occupy streets and highways. Municipal ordinances in these matters are prima facie reasonable, but on complaint the commission may judge of their reasonableness.

Franchises. No utility license or franchise may be granted to any concern in a municipality where an existing utility has an indeterminate permit without first securing from the commission a declaration of public convenience and necessity. Construction of municipal plants is similarly restricted, but an existing utility may be condemned or purchased. Every license or franchise granted to any utility is subject to municipal purchase, as with indeterminate franchises. A concern accepting an indeterminate permit agrees to the purchase of its property used and useful in the public service on conditions determined by the commission, and it waives the ordinary rights and remedies of condemnation. The Circuit Court may judge of the necessity of a municipality's taking over a plant, whereupon the commission may proceed to hearings on value. Dissatisfied parties may appeal and attack in the Circuit Court the value established by the commission.

Financing. Right to liens in corporate property is declared a special privilege the control of which is vested in the State. No corporation may issue stocks, bonds, or notes except for money, labor, or property actually received equal to par value. No utility may issue stocks, bonds, or notes exceeding reasonable necessity for the purposes of issue. Securities must be issued at not less than 75 per cent of par value. The ratio of bonds and notes to stock must be reasonable.

Enforcement. The commission has the power, and it is its duty, to enforce the utility laws and to report violations to the Attorney-General. On request district attorneys or county prosecutors must aid the commission. Any utility or person dissatisfied with the demands of the commission may appeal within 90 days to the Circuit Court.

Municipal Authority in California. The provisions of the California constitution and statutes giving municipal authorities the choice between continuing their old powers of regulation of privately owned utilities and transferring to the State commission are of interest. All regulative powers previously vested in local governments ceased on the adoption of the constitutional amendment and passage of the Utilities Act, except where political subdivisions voted to retain such authority. Local governments may at any later time surrender their powers of utility regulation to the commission or they may by the same means resume powers previously surrendered. Such transfers, one way or the other, may apply to a part or all of the utilities operating in the municipality.

Bibliography. "Public Utility Legislation in the United States, including the Interstate Commerce Act and Amendments thereto," fills 1165 closely printed quarto pages following the report of the *Proceedings of the National Association of Railway Commissioners* for 1911 (Chicago, 1912). *Commission Regulation of Public Utilities* (New York, 1913) is an analysis by a committee of the National Civic Federation of the "laws of the 43 States which in 1912 had central commissions for the regulations of utilities." See also Henry Floy, *Valuation of Public Utility Properties* (New York, 1912); H. A. Foster, *Engineering Valuation of Public Utilities and Factories* (ib., 1912); C. L. King (ed.), *Regulation of Municipal Utilities* (ib., 1912); O. L. Pond, *A Treatise on the Law of Public Utilities Operating in Cities and Towns* (2d ed., Indianapolis, 1913); R. H. Whitten, *Valuation of Public Service Corporations for Rate Making and Public Purchase* (New York, 1913); id., "Regulation of Public Service Companies in Great Britain" (reprint from *Report of the Public Service Commission First District of New York* (ib., 1913); Hayes, *Public Utilities: Their Fair Present Value and Returns* (ib., 1915). Decisions of the various public-service commissions and of State and Federal courts in utility cases are published regularly in *Public Utilities Reports, Annotated* (Rochester, N. Y., 1915 et seq.).

PUBLIC WASHHOUSES. See Washhouses, Public.

PUBLIL'IUS SYRUS. A Roman writer of mimes. He was a native of Syria. He was brought to Rome when a boy as a slave; but his master was kind, educated him, and finally gave him his freedom. His works are lost, but some of his moral apothegms, which have been preserved by Seneca and other ancient writers, are remarkable for their laconic precision and justness of sense. These have been gathered under the title, *Publili Syri Mimi Sententiæ*, edited by Meyer (Leipzig, 1880), Friedrich (Berlin, 1880), and Bickford-Smith (Cambridge, 1895). Consult: W. S. Teuffel, *Geschichte der römischen Literatur*, vol. ii (6th ed., Leipzig, 1909); J. W. Duff, *A Literary History of Rome* (London, 1909); Martin Schanz, *Geschichte der römischen Litteratur*, vol. ii, part i (3d ed., Munich, 1911).

PUBLISHING. See Printing.

PUB'LIUS. The signature used by Hamilton, Jay, and Madison in their papers contributed to the *Federalist*. Papers 2–5 and 64 were written by Jay; 10, 14, 18–20, 37–63 by Madison; and the remainder by Hamilton.

PUCCINI, pōōt-chē'nē, Giacomo (1858–). An Italian operatic composer, born at Lucca, June 22, 1858. Beginning with his great-great-grandfather Giacomo (born 1712) all his male ancestors in the direct line were musicians of prominence—Antonio (born 1747), Domenico (born 1771), Michele (born 1813). Young Giacomo received his first instruction from a local teacher, Angeloni, and then entered the conservatory at Milan, where his teachers were Bazzini (q.v.) and especially Ponchielli (q.v.). His first opera, *Le Villi* (1884), attracted considerable attention in Italy, but Puccini waited five years before coming out with his second work, *Edgar.* Though musically an advance over the first opera, it failed because of its ab-surd and impossible libretto. The tremendous success of *Manon Lescaut* (1893) was even surpassed three years later by that of *La Bohème*, which immediately found its way into all the opera houses of the world. *Tosca* (1900) proved a distinct disappointment, chiefly because of its disgusting libretto. With *Madama Butterfly* (1904) he scored his greatest triumph. When it was produced at the Metropolitan Opera House in 1907, the composer was invited by the management to superintend the rehearsals. Many now regarded Puccini as the legitimate successor of Verdi, and unquestionably he was by far the greatest of contemporary Italian dramatic composers. His next work, *The Girl of the Golden West* (*La Fanciulla del West*), on a typical American subject, was commissioned by the Metropolitan Opera House and produced there for the first time in 1910. Although a seeming success at its première (chiefly owing to the composer's presence), this work could not maintain itself either in America or subsequently in Europe. Owing to the outbreak of the Great European War his two operas, *La Rondine* and *I Due Zoccoletti* (both completed in 1915), were not performed in that year.

Without doubt Puccini became the most popular and most successful Italian dramatic composer of the early twentieth century. He surpasses all his contemporaries in fertility and power of melodic invention. His technical equipment is ample, his treatment of the orchestra masterly, his sense of dramatic characterization strongly developed. His musical inspiration is almost invariably conditioned by the dramatic situation: whenever the text is effective the music is truly inspired; when the text becomes prosy the music also becomes dull and labored. *Madama Butterfly* is Puccini's masterpiece, because here the composer had an excellent libretto (from the novel by John Luther Long, q.v.). He failed signally in *The Girl of the Golden West* because the subject was not fitted for musical setting. Consult R. A. Streatfield, *Masters of Italian Music* (London, 1895); Wakeling Dry, *Giacomo Puccini* (New York, 1906).

PUCCINIA GRAMINIS, pŭk-sĭn′ĭ-ȧ grăm′ĭ-nĭs. See Rust.

PUCCOON′ (from the North American Indian name). A name for various plants or their colored juices. In the South it is applied to *Sanguinaria* (q.v.); in the Southwest to *Lithospermum gmelini* (hairy puccoon) and *Lithospermum canescens* (hoary puccoon or alkanet). *Hydrastis canadensis*, golden seal, is often called yellow puccoon. See Hydrastis.

PUCHTA, pu̧k′tȧ, Georg Friedrich (1798–1846). A German jurist who systematized the theories of the historical school of law. He was born at Kadolzburg, was educated at Erlangen, taught there (1820–28), was professor at Munich until 1835, then in Marburg, in Leipzig (1837–42), and for the last three years of his life in Berlin. Puchta was a profound thinker and clear stylist. His more important works are: *Civilistische Abhandlungen* (1823); *Lehrbuch der Pandekten* (1838; 12th ed., 1877); *Einleitung in das Recht der Kirche* (1840); *Kursus der Institutionen* (1841–47; 10th ed., 1893); *Vorlesungen über das heutige römische Recht* (1847–48, ed. by Rudorff; 6th ed., 1873–74).

PUCK. In folk lore, a certain elf or fairy. It is he who plays an important part in Shakespeare's *Midsummer Night's Dream*.

Puck is also the name for the rubber disk substituted for a ball in the modern game of hockey (q.v.).

PÜCKLER-MUSKAU, pu̧k′lẽr-mu̧s′kou, Hermann Ludwig Heinrich, Prince (1785–1871). A German author, and authority on gardening. He was born in Muskau, Lusatia, and was educated at Halle and Leipzig. He entered the army in 1803, served with much distinction, and in 1822, after his retirement, was made prince by the King of Prussia. He traveled much in the Orient and in England, where he developed a love for landscape gardening. Gardens on his own estate at Muskau, in Weimar, and elsewhere were laid out after the plans described in his *Landschaftsgärtnerei* (1834; new ed., 1903). His books of travel, especially *The Travels of a German Prince in England* (trans. by Sarah Austin, 1832), *Tutti Frutti* (trans. by Spencer, 1834), and *Mehemet Ali and Egypt* (1848), made a strong impression on account of their brilliant style. His first work, *Briefe eines Verstorbenen* (1830), a diary descriptive of manners and customs of the aristocracy of many lands, is still read. Consult: L. Assing, *Fürst H. von Pückler-Muskau* (Hamburg, 1873); Petzold, *Fürst Pückler Muskau in seiner Bedeutung für die bildende Gartenkunst* (Leipzig, 1874); L. Assing, *Briefwechsel und Tagebücher* (9 vols., Berlin, 1873–76).

PUCRAS, pŭk′ras (East Indian name), or Koklass. A pheasant of the Himalayan genus *Pucrasia*, recognizable by the long crests and still longer ear tufts of the cocks.

PUDDING STONE. See Conglomerate.

PUDDLING. See Iron and Steel, Metallurgy of.

PUDICITIA, pū′dĭ-sĭsh′ĭ-ȧ (Lat., modesty). The goddess of chastity and modesty, at first worshiped only by patrician Roman matrons, but later by plebeians as well. She corresponds to the Greek goddess Αἰδώς.

PUDSEY, pŭd′zĭ. A woolen-manufacturing town in the West Riding of Yorkshire, England, 3 miles east of Bradford. It was incorporated in 1899, and has shown much municipal activity and improvement. Pop., 1901, 14,900; 1911, 14,027.

PUDSEY, Hugh de. See Puiset, Hugh de.

PUDU, po͞o′do͞o (South American name). A very small white-tailed, stout-limbed deer of the Chilean Andes (*Pudua humilis*), which has antlers in the form of minute simple spikes and has no upper canine teeth. It is restricted to the high mountains of Chile. See Plate of Fallow Deer, Musk, etc., with the article Deer.

PUEBLA, pwā′blä. An inland state of Mexico (Map: Mexico, K 8). Area, 12,204 square miles. The state includes one of the most elevated portions of Mexico. On the west frontier rise the volcanic peaks of Popocatepetl and Iztaccihuatl and on the east boundary the great cone of Orizaba. The northern part is traversed by the Sierra Madre, and the extreme north slopes towards the low coast region. The central portion belongs to the plateau of Anahuac (q.v.), while in the south deep valleys are the most prominent features. The chief river is the Apoyac, or upper course of the Mescala, which traverses the south portion. The climate varies considerably according to the elevation, and the soil is generally fertile in the valleys, where sugar, coffee, rice, and cotton are cultivated. The more elevated regions are devoted chiefly to the raising of cereals. Grazing is carried on extensively in some parts of the state. The mineral deposits are believed to be considerable, but mining is chiefly confined to working of copper, with some gold and silver, and quarrying of marble. The manufacture of cotton thread and cloth is the most important industry, and the state produces about one-half the total output of the Republic. The other manufactures include liquors, beds, biscuits, cigarettes, candles, glass, cement, ornamental ironwork, tiles, etc. The state is crossed by several railroad lines. Pop., 1900, 1,021,133; 1910, 1,101,600, including a large number of civilized Indians. Capital, Puebla (q.v.).

PUEBLA, or PUEBLA DE ZARAGOZA, formerly PUEBLA DE LOS ANGELES. The capital of the State of Puebla, Mexico, and the third city in size and importance in the Republic. It is situated on the Atoyac River, 60 miles southeast of Mexico City, at an elevation of 7200 feet above the sea, and between the bases of Mounts Malinche and Popocatepetl (Map: Mexico, K 8). It is a very pleasant and well-built city, regularly laid out with broad streets and spacious squares. The uniform slope of the ground gives it a good natural drainage, which is further reënforced by a good artificial system, so that it is a very healthful city. Among its many handsome buildings the most prominent is the cathedral, which rivals that of Mexico and whose two fine towers dominate the view of the city. Other notable buildings and institutions are the Palace of Justice, the Alhóndiga, a large and handsome building occupied by the State Legislature, the State College with a large library, the School of Medicine, the Palafoxiana Library containing over 100,000 volumes, the Academy of Fine Arts, and several theatres and hospitals. The city is an important commercial and industrial centre. It has several cotton and woolen mills, foundries, and glass factories, and is connected by rail with Mexico, Vera Cruz, Orizaba, and Oaxaca. It is the residence of a United States consular agent. Pop., 1910, 96,121.

Puebla was founded as a mission station in 1530 by Toribio de Benaventa. In 1847, during the war with the United States, it was occupied for some time by the American forces. In 1862 it was attacked by the French army, which was repulsed by General Zaragoza, in whose honor the city received its present name. The French, however, captured it in the following year. In November, 1914, Carranza set up his government here, but the city was soon captured by the Villistas and Zapatistas. It was recaptured by Obregon in January, 1915.

PUEBLO, pwĕb′lō (Sp., village). A name first used by the Spaniards, and later adopted by the Americans, to designate the semicivilized agricultural and sedentary Indians dwelling in adobe or stone-built communal houses in the arid region of the southwestern United States, chiefly along the Rio Grande and its tributaries. The term "village Indians" was used in distinction from the ruder wandering tribes without reference to political or linguistic affiliations. The existing pueblos, or settlements, now number 27, besides the Mexicanized colonies of Isleta in Texas and Senecú in Mexico, together with several subpueblos, representing in all four distinct stocks, with about twice as many languages and several additional dialects. With the exception of Zuñi, the seven Moki villages in Arizona, and the two Pueblo colonies below El Paso, all the existing pueblos are within a limited area of north-central New Mexico, but the hundreds of ruins, together with traditional and historical evidence, prove that the area of Pueblo culture formerly comprised the whole region from the Pecos to the middle Gila and from central Colorado and Utah southward into Mexico. This does not mean that all of the ruins were occupied at the same time, but that at one time or another every part of the region in question was within the sphere of Pueblo culture. There seems to have been a gradual withdrawal from the northern and other more exposed sections and a concentration upon central points, due to the invasion of the savage Apache and Navaho. Some Pueblo tribes have distinct traditions of their former occupancy of particular ruins, frequently remote from their existing villages.

The recorded history of the Pueblos begins with their discovery by Father Marcos de Niza in 1539, followed up by the expedition of Coronado (q.v.) the following year. The occupation and conquest of the country was not begun in earnest until 1598. By 1630 missions were established in nearly every pueblo, and the whole country was mapped out into districts and held in subjection by Spanish garrisons. The persons of Spanish birth formed only a small per cent of the population of the region. The nomadic tribes became unruly and made desperate raids to obtain horses. Several pueblos had to be abandoned on this account. The priests attempted to stamp out the native religion, but gained only the smoldering enmity of the native medicine men. In 1680, under the leadership of Popé, a medicine man of the Tewa, there was a simultaneous rising of all the Pueblos, so sudden and complete in its surprise that priests, soldiers, and civilians were everywhere butchered, and the survivors after holding out for a time under Governor Otermin at Santa Fé fled to El Paso, leaving not a single Spaniard in New Mexico. A few of the Piro and Tigua tribes who adhered to the Spaniards followed them in their retreat and were afterward colonized respectively at Senecú and Isleta, below El Paso. The Spaniards made several attempts to reconquer the colony, but it was not until Diego de Vargas was put in charge of the forces in 1692 that they were successful. The missions, however, were not all reëstablished, and most of the tribes relapsed into their primitive religion and ceremonial. At Awatobi, one of the Hopi towns, the people were supposed to favor the return of the priests. In 1700 the village was burned and its inhabitants massacred by their neighbors of Walpi. As a result of the rebellion nearly all the villages changed their sites. Their history from that period until the Mexican War brought them under American jurisdiction is of little outside importance. By the Treaty with Mexico they were declared American citizens on the same terms as their Mexican neighbors, but the new territorial administration refused to admit them to equal rights, and they continue to be treated as Indians under government control according to the regular agency system. They are entirely self-supporting, however, and ask and receive little beyond schools and recognition of certain village and farming reservations.

Physically the Pueblo Indians are small in stature, but very strong, being able to walk or even run long distances, or climb steep or difficult mountain trails, under burdens that would tax the strongest white man. They are darker than the Plains Indians, with mild and friendly countenances, indicative of their disposition. They are not aggressive warriors, fighting usually only in self-defense and preferring rather to avoid trouble with the wild Apache and Navaho by building their settlements upon the tops of high cliffs, to be ascended only by narrow and easily defended trails. Hence the name Cliff Dwellers frequently applied to them and more particularly to the extinct inhabitants of the northern cañon ruins. Since the government has interfered to restrain the predatory tribes, most of the Pueblos have come down upon the plain, but the Hopi of Arizona still have their villages upon mesas several hundred feet above the surrounding level. Their houses are solidly built communal structures of adobe or stone set in clay mortar, with square rooms and flat roofs, through which trapdoors with ladders give access to the interior, the outer walls being frequently without door or window as a precaution against attack. Rooms are added to the original structure as needed, and a whole village frequently forms one compact building, with stories in terrace style, one above another. An important feature of each pueblo is the *kiva* or underground chamber for the use of the various ceremonial societies.

Their dress is of buckskin or of cotton or woolen fabrics of their native weaving. In some tribes, as the Hopi, the unmarried women are distinguished by a peculiar arrangement of the hair. They are all basket makers, each pueblo having its own method or design. In variety of pattern and beauty of decoration they have developed the pottery art to a higher stage than was found anywhere else in the United States. Their men are also skillful wood carvers, particularly in the shaping of ceremonial figurines. Their main dependence is agriculture, each pueblo cultivating its fields in common, usually by aid of irrigation from an adjoining stream, and producing corn and beans in many native varieties, with melons, squashes, chile, tobacco, as well as peaches, introduced by the early Franciscan missionaries. The grinding of the meal upon stone metates and the baking of the bread upon heated slabs of stone occupy a large share of the woman's indoor time, while pottery making and the field occupy her attention outside. The men, besides their field work, do the weaving and procure firewood, which must generally be brought from long distances on the backs of burros. The interval between crop seasons is given to a succession of elaborate and spectacular ceremonials, one of which, the snake dance (q.v.) of the Hopi, has achieved a national reputation. Most of these ceremonials are of a sacred character, being either invocations or thanksgiving for the rain and the crops, and each is in the keeping of a special secret society.

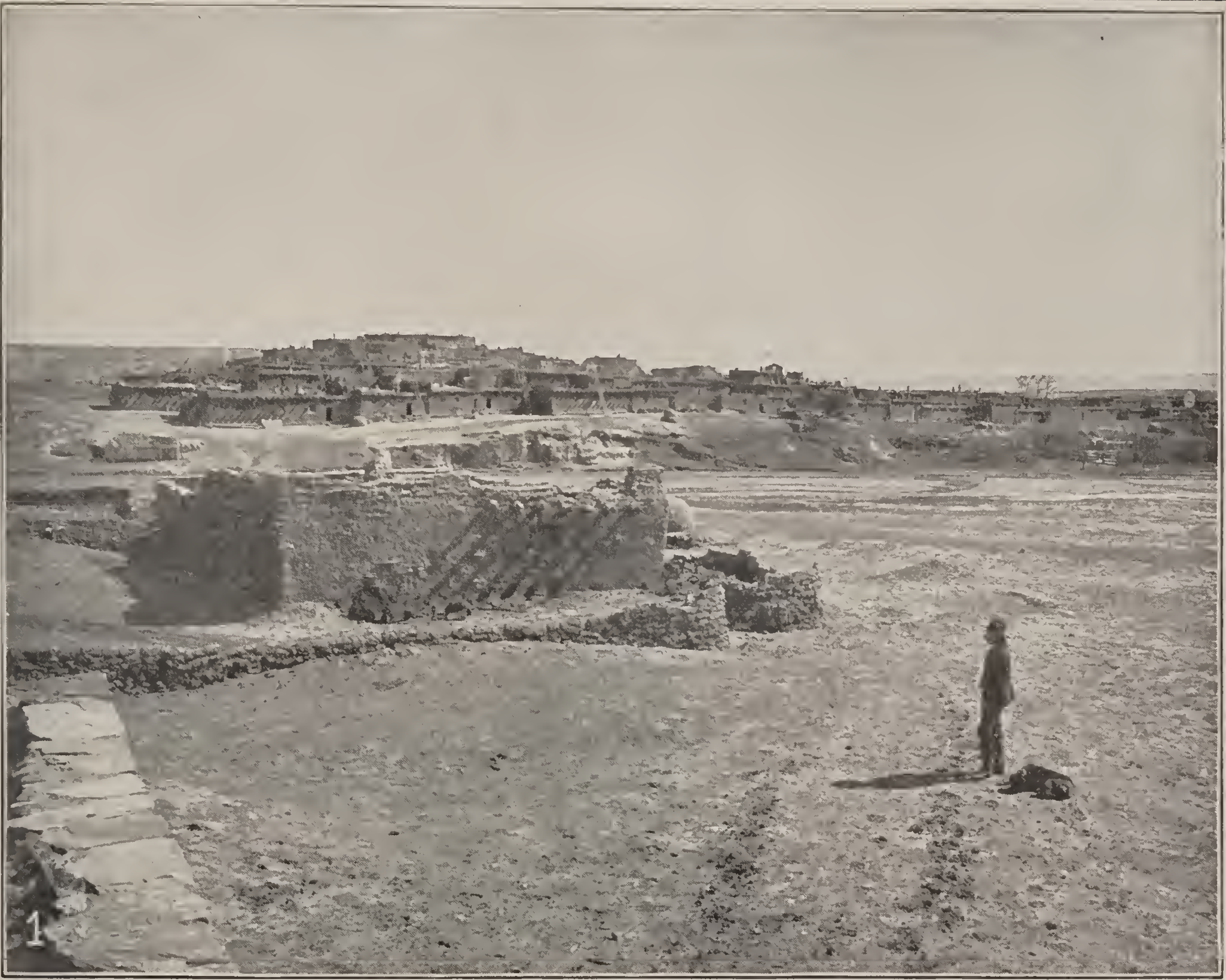
Family life is based upon the clan system, the number of clans being very large in proportion to the population. The position of woman is high. The marriage ceremonial is elaborate, including feasting, processions, and dances, and only one wife is allowed. The government is by villages rather than by tribes, each pueblo having a peace chief or governor, assisted by councilors, together with a war chief.

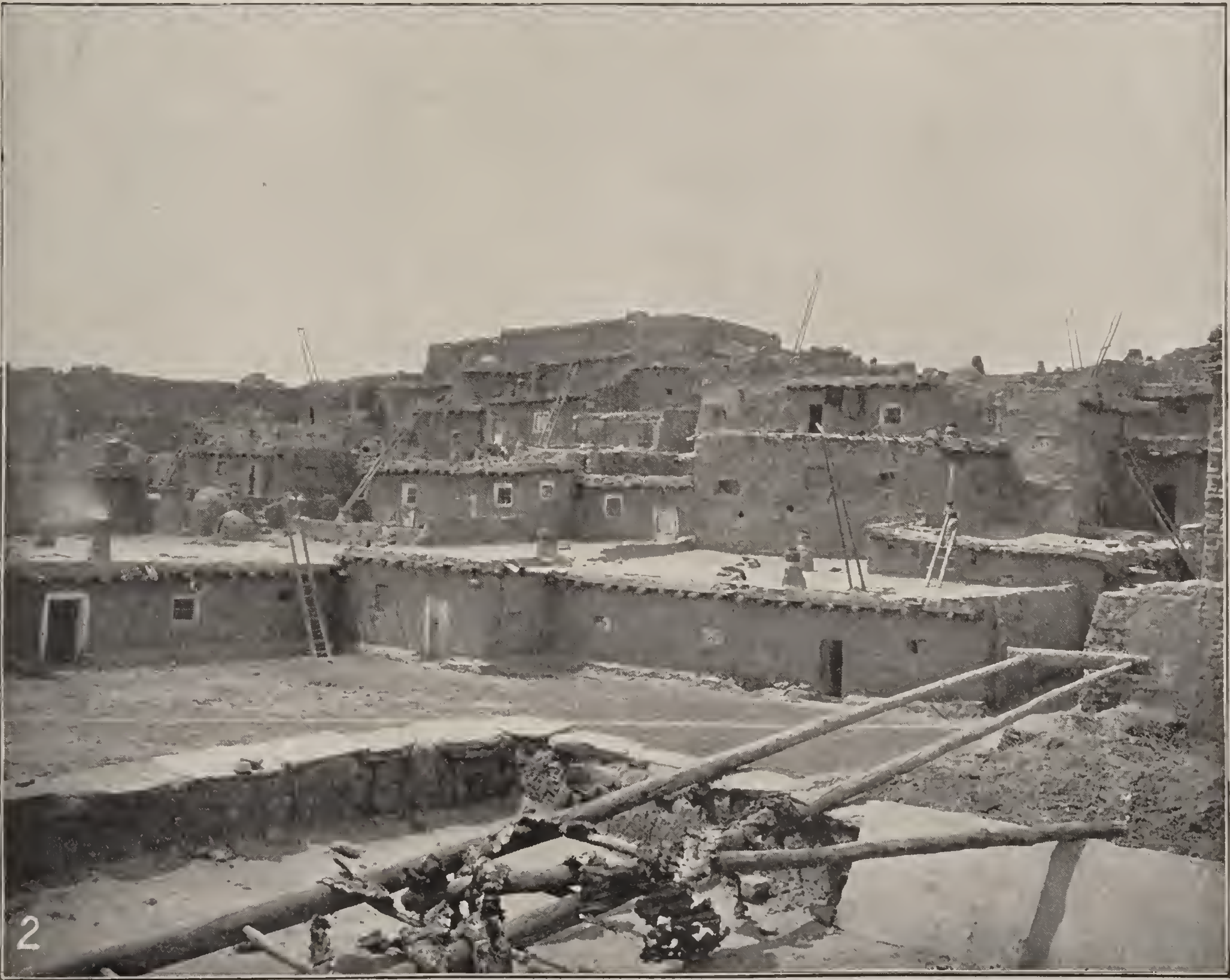
In 1915 the number of the Pueblos was about 10,000. Excluding the seven Hopi (Moki) villages in Arizona, with 1941 souls, and the two Mexicanized pueblos of Isleta and Senecú below El Paso, the existing inhabited pueblos number 18, all in New Mexico, as follows: Acoma, 691; Cochiti, 237; Isleta, 910; Jemez, 499; Laguna, with subpueblos of Pahuate, Paraje, Casa Blanca, and others, 1441; Nambe, 88; Picuris, 104; Sandia, 73; San Felipe, 490; San Ildefonso, 123; San Juan, 384; Santa Ana, 211; Santa Clara, 277; Santo Domingo, 817; Sia, 109; Taos, 517; Tesuque, 77; Zuñi, 1664. They are classified by linguistic stocks as follows: Shoshonean: Mashongnivi, Shumopovi, Shupaulovi, Sichumovi, Oraibi, Walpi. Tañoan: Isleta (New Mexico), Isleta (Texas), Jemez, Nambe, Pecos (extinct), Picuris, Pojoaque (extinct), Sandia, San Ildefonso, San Juan, Santa Clara, Senecú (Chihuahua, Mexico), Taos, Tesuque, Tewa or Hano (with Hopi, Arizona). These are grouped under cognate languages as follows: *Tano* or *Tigua* (Isleta, New Mexico; Isleta, Texas; Sandia); *Taos* (Taos, Picuris); *Jemez* (Jemez, Pecos); *Tewa* or *Tegua* (Nambe, Pojoaque, San Juan, San Ildefonso, Santa Clara, Tesuque, Tewa or Hano); *Piro* (Senecú); *Keresan* (Acoma, Cochiti, Laguna, San Felipe, Santa Ana, Santo Domingo, Sia); *Zuñian* (Zuñi). Consult S. D. Peet, *Cliff Dwellers and Pueblos* (Chicago, 1901), and J. W. Fewkes, "Two Summers' Work in Pueblo Ruins," in *Bureau of American Ethnology, Twenty-second Annual Report* (Washington, 1903). See Colored Plate of AMERICAN INDIANS, under INDIANS; also the accompanying Plate showing a Zuñi pueblo, and Plate of POTTERY.

PUEBLO. The second largest city of Colorado, the county seat of Pueblo County, and an important commercial and industrial centre, 120 miles south by east of Denver (Map: Colorado, E 3). Situated in a large basin at the east foothills of the Rocky Mountains and on both sides of the Arkansas River, at the junction of the Fontaine qui Bouille, Pueblo enjoys a natural location for a great railway and business centre. Its transportation facilities comprise the Denver and Rio Grande, the Atchison, Topeka, and Santa Fe, the Missouri Pacific, the Colorado-Kansas, the Chicago, Rock Island, and Pacific, and the Colorado and Southern railroads. In the centre of a vast irrigated district, extending 250 miles along the Arkansas River, the city is interested to a large extent in stock raising and farming, the chief products being alfalfa and sugar beets. Near the city are deposits of coal, limestone, oil, glass sand, and clay, and the tributary region includes very highly productive mineral districts. Pueblo is the great distributing and receiving point for this section of vast natural wealth. It has become known as the Pittsburgh of the West, being famous for its iron and steel and smelting industries. There are in the city several smelters producing lead, silver, and gold, zinc, and copper; the immense plant of the Colorado Fuel and Iron Company, which manufactures various iron and steel products; foundries and machine shops, including railroad car shops; manufactories of fire brick, furniture, etc.; and large stockyards. According to the census of 1909, an aggregate capital of $4,137,000 was invested in these industries, which had a production valued at $3,345,000.

Pueblo has the McClelland Public Library, law libraries, the State Insane Asylum and several other charitable institutions, a county courthouse costing $1,000,000, and the State Mineral Palace and Park. In the building last mentioned

PUEBLO OF ZUÑI INDIANS





1. ZUÑI PUEBLO FROM THE SOUTH

2. VIEW IN THE PUEBLO

is a complete collection of the minerals of Colorado. There are 330 acres of public parks and playgrounds. Educational institutions include two fine high schools, Benedictine College, Loretta Academy, Gulliford Academy, 18 grade schools, and two business colleges. The government, under a charter of 1911, is vested in three commissioners. Fire department officials, the police judge, and city physician are chosen by civil-service examination. A few Mormons settled temporarily on the site of Pueblo in 1846, and about 1850 a trading post was established here, the inhabitants of which, however, were massacred by the Ute Indians in 1854. The present city was laid out in 1859 and was chartered in 1873. In 1887 Pueblo, South Pueblo, and Central Pueblo consolidated. Pop., 1900, 28,157; 1910, 44,395; 1914 (U. S. est.), 51,218.

PUEBLO INDIANS. See Indians; Hopi.

PUEBLO PLAN. See Pedagogy.

PUECH, pēsh, Denys (1854–). A French sculptor. He was born at Gavernac (Aveyron) and studied chiefly in Paris at the Beaux-Arts under Jouffroy, Falguière, Chapu, and Dubois, and in 1884 he won the Prix de Rome. Puech's art is realistic, graceful, delicate, and restrained. He is especially celebrated for his busts, which have an eighteenth-century elegance and charm —Madame Cauvin (Luxembourg), Mademoiselle Rosita Mauri, Madame Bartet, Mrs. Lytton, President Loubet (Louvre), Sainte-Beuve (Luxembourg Gardens), and Jules Claretie. Among his graceful and imaginative ideal works are "The Seine," "The Muse of André Chenier," and "The Siren," all in the Luxembourg. Also to be mentioned are his monuments to Chaplin, Leconte de l'Isle, Garnier, Gavarni, and Jules Simon, all in Paris. He received the Grand Prix at the Paris Exposition (1900), and became a member of the Institute in 1905. Consult the monograph by Jaudon (Rodez, 1908).

PUELCHE, pōō-ĕl′chȧ (eastern people). A people of Araucan stock roving over the pampas region of the Río Negro, southern Argentina. They are so called in distinction from the cognate Moluche (western people), in and west of the Andes. Those living in the foothills of the Andes are frequently also distinguished as Pehuenche (pine forest people). In language and general characteristics they differ but slightly from the others of the same stock, but are rather wilder than those of Chile, spending much of their time on horseback and seldom staying long in one place. They carry on a considerable trade in cattle, salt, and tobacco with the tribes west of the mountains. They have large herds of cattle and horses, are expert with the bolas, and fond of gambling and music. They wear their hair flowing or gathered behind into a queue decked with silver beads, with a bright turban about the head and a blanket wrapped about the waist and held in place by a belt. Physically they are of medium stature, broad-chested, and inclined to corpulency. They pluck out the beard and eyebrows, and the women paint their faces in red and black. For Puelchean dialect, consult D. G. Brinton, *Studies in South American Languages* (Philadelphia, 1892), and A. F. Chamberlain, in *American Anthropologist*, n. s., vol. xiii (Lancaster, Pa., 1911).

PUENTE DE CALDERÓN, pwän′tȧ dȧ kȧl′dȧ-rōn′ (Sp., bridge of Calderón). A bridge over the Río Grande de Santiago, about 30 miles from the city of Guadalajara, Mexico, noted as the scene of the defeat of the revolutionary forces under Hidalgo, about 80,000 poorly armed, by Calleja, with 6000 well-equipped troops, Jan. 17, 1811.

PUENTE GENIL, Hȧ-nēl′. A town of south Spain in the Province of Córdoba, situated 32 miles south of Córdoba, on the river Genil, which is here crossed by a stone bridge, and on the railroad to Malaga (Map: Spain, C 4). It has a secondary college and a public library; it is surrounded by olive orchards, and its principal industry is the manufacture of olive oil. Pop., 1900, 12,959; 1910, 14,230.

PUENTES (pwän′tȧs) **DAM,** Failure of. See Dams and Reservoirs, *Failures of Dams.*

PUERPERAL (pů-ẽr′pẽr-*a*l) **FEVER** (from Lat. *puerpera*, parturient woman, from *puer*, child + *parere*, to bear), Puerperal Sepsis, Childbed Fever. A fever appearing in puerperal women within a week after labor, usually from the third to the fifth day, attended with septic infection of the blood and acute inflammation of one or more of the reproductive organs or the loose cellular tissues connected with them, and often characterized by severe and widespread complications. This fever was long considered specific, and under the names childbed fever, lying-in fever, etc., was a fatal and frequent complication of the puerperium, particularly in lying-in hospitals. It is now known that the disease is due to infection from pus-producing microörganisms (the streptococcus in 80 to 95 per cent of the cases) introduced into the genital tract by contact with unclean hands, instruments, dressings, clothing, or bedding. The credit of pointing out the true origin of this disease belongs to Dr. Oliver Wendell Holmes, who in 1843 promulgated the doctrine of extragenital infection. In 1847 Semmelweiss (q.v.) proclaimed the same teachings in Europe. Since modern antiseptic midwifery has caused the hands, instruments, and the materials used in the lying-in room to be sterilized, puerperal fever has become a comparatively rare occurrence, and a better knowledge of its pathology and prompt treatment of its earliest symptoms make it a much less dangerous and severe sequel of labor.

The complications that may arise in puerperal fever are both grave and numerous. The large uterine vessels readily absorb infection and distribute it to all parts of the body. Pericarditis, pleurisy, endocarditis, peritonitis, pneumonia, and inflammation of the joints may occur, and the liver, kidneys, bladder, or spleen may be secondarily infected. The disease is usually ushered in with a chill, followed by an irregular fever, nausea, extreme general depression, with a rapid, feeble pulse, and shallow respiration. The expression is anxious, the tongue heavily coated, and the urine scanty and albuminous. Severe cases run a rapid course and often terminate fatally within a week.

The prevention of puerperal infection by the exercise of rigid cleanliness in every labor case, particularly when instrumental interference is demanded, is now one of the most important duties of the obstetrician. (See Antiseptic.) When, however, infection has taken place, on the appearance of the initial symptoms the genital tract should be irrigated at frequent intervals with warm antiseptic solution. If this measure does not prove efficient in abating the fever in a short time, it is necessary to explore the uterine cavity and remove by means of a blunt curette the decomposing material that is almost certain to be found there. Frequent douching is continued until convalescence sets in. The general treatment is stimulating and supportive.

PUERPERAL INSANITY. A term applied to mental derangement occurring during the first six weeks of the puerperal state. The great changes comprised in the onset of labor and the beginning of uterine involution, with the nerve drain, the rapid metabolism of tissue, and the necessity for sudden adjustment to a new order of life combine to produce a condition in which the agencies that cause insanity may more easily operate. The term does not denote any one form or even any one group of psychoses. The disorder may be caused by the action of a toxin produced within the body (an autointoxication) or by infection from material retained within the uterus or introduced during delivery of the child, or by grave anæmia following a hemorrhage. All three of these causes may operate simultaneously. The clinical picture is most frequently that of primary mental confusion or of dementia precox. In some cases the exhaustion of the puerperium allows the development of a latent psychosis as of hysterical insanity. The onset of an attack of puerperal insanity is usually sudden, but is sometimes preceded by nerve fag, insomnia, restlessness and garrulity, fickle fancy, unreasonable likes or dislikes, and perverted tastes and emotions. Suspicion and obstinacy, violent hatred of husband or infant follow. Delusions and hallucinations of a terrifying kind may occur, and there may be constant excitement, perpetual talking in an incoherent way, impulsive action, obscenity in speech and conduct, and even homicidal or suicidal impulse.

Moral shock has some influence in the production of this insanity, for over 25 per cent of the cases occur in mothers of illegitimate children. However, it must be remembered that a fair proportion of unmarried mothers are mildly demented or feeble-minded. It more often occurs in primiparæ. Eighty per cent of the cases recover.

Treatment must be instituted according to the causes operating, and attention must be given to the genital apparatus, the digestive tract, the capacity for sleep, and the necessity for hydrotherapy. Custodial care is, in the vast majority of the cases, necessary; for others removal from familiar home surroundings is valuable. Consult W. B. Lewis, *Text-Book of Mental Diseases* (2d ed., Philadelphia, 1899), and Joseph Rogues de Fursac, *Manual of Psychiatry*, translated and edited by A. J. Rosanoff (New York, 1914).

PUERTA, MARQUIS DE LA. See MORILLO, PABLO.

PUERTO CABALLOS, pwâr'tō kȧ-bä'yōs. A town of Honduras. See PUERTO CORTÉS.

PUERTO CABELLO, kȧ-bā'yō. A seaport in the State of Carabobo, Venezuela, situated on the Golfo Triste, 55 miles west of Carácas, with which it is connected by rail (Map: Venezuela, D 1). It has a hot and unhealthful climate, but an excellent harbor protected by a chain of islands and fortified. In 1912 it was the second port of Venezuela in exports and third in imports. Exports include coffee, cocoa, hides, rubber, divi-divi, sugar, and cattle; imports, textiles, foodstuffs, and other manufactured articles. It is the seat of a United States consul. Pop. (est.), 18,282. In the eighteenth century Puerto Cabello was an important Venezuelan town. In 1743 it repulsed the attack of an English squadron. The last battle of the war of independence was fought here in 1823. It was an important point during the English-German blockade of 1903.

PUERTO CORTÉS, kôr-tās', or PUERTO CABALLOS. A port of Honduras, situated on a bay of the Gulf of Honduras (Map: Central America, D 2). It is the best harbor on the north coast of the Republic and is the terminus of a railroad connecting with the interior. It exports mahogany, cedar, vanilla, and hides. In 1911–12 it ranked as the second port of the Republic. It is the seat of a United States consul. Pop. (est.), 2500.

PUERTO DE SANTA MARÍA, dȧ sän'tȧ mȧ-rē'ȧ, commonly known as EL PUERTO. A town of Spain, in the Province of Cadiz, situated on the Bay of Cadiz, at the mouth of the Guadalete, 5 miles northeast of Cadiz (Map: Spain, B 4). The town lies amid pleasant surroundings and is well built, with a fine, large main street. There are several old convents, a well-equipped Jesuit college, a modern theatre, and a large bull ring. A characteristic feature of the town is the *bodegas*, or wine stores—large buildings with thick walls and narrow windows. El Puerto is the principal port for the exportation of sherry wines, since it is the nearest port to Jérez de la Frontera (q.v.), with which it is directly connected by rail. Other industries include the manufacture of brandies, starch, flour, soap, and glass. There are exports of fish. Pop., 1900, 19,373; 1910, 17,984.

PUERTO LA MAR, lȧ mär. A seaport of Chile. See COBIJA.

PUERTO MEXICO. A Mexican seaport. See COATZACOALCOS.

PUERTO MONTT, mōnt. The capital of the Province of Llanquihue (q.v.), Chile (Map: Chile, E 6).

PUERTO PLATA, plä'tȧ. A port of the Dominican Republic, situated on the north coast of the island (Map: West Indies, E 3). The town has a well-protected harbor and considerable export trade, chiefly in tobacco. It has steamship communication with the United States and Europe and is connected with the interior by rail. It is the seat of a United States consul. Pop. (est.), 10,000.

PUERTO PRINCESA, prēn-thā'sȧ. A town in the Province of Paragua, Philippine Islands, situated on the east coast of the island of Palawan, 80 miles southwest of Taytay (Map: Philippine Islands, B 6). It was formerly a Spanish penal colony. Pop., 1903, 1208. It was the capital of Paragua Sur while that province existed.

PUERTO PRÍNCIPE, prēn'thē-pȧ, or CAMAGÜEY. A province of Cuba, occupying the east central portion of the island (Map: Cuba, H 5). Area, 10,500 square miles. It is the largest province of the Republic next to Santiago. The north coast is lined with a chain of large islands, and innumerable islets lie off the south coast. The surface is an undulating plain, with some detached groups of hills in the north part. The most extensive forests of the island are found in this province, and lumbering, copper mining, and cattle raising are the chief industries. Agriculture is here less developed than in the other provinces, and sugar and tobacco plantations are confined chiefly to the district around the capital, Puerto Príncipe (q.v.). The province is by far the most thinly populated in the island. Pop., 1899, 88,234; 1907, 118,269; 1914, 154,647.

PUERTO PRÍNCIPE, or Camagüey. Capital of the Province of Puerto Príncipe (Camagüey), Cuba (Map: Cuba, H 5). It lies in a broad, sandy, and elevated savanna region, 25 miles from the north and 45 miles from the south coast of the island. It is very antiquated in appearance, with narrow, winding streets and old houses built of brick and stone. It has three plazas, numerous churches, an institute of secondary instruction, and a hospital. The chief industries are connected with cattle raising, for which the surrounding country is well adapted, and cattle products are the chief exports, though some sugar is also produced. The city is connected by rail with its port, Nuevitas, on the north coast, and it is a station on the Cuban main trunk railroad, completed in 1902, which connects it with Havana and Santiago. Pop., 1899, 25,102; 1907, 26,616. Puerto Príncipe was an important military post during the Spanish régime and was surrounded by an extensive system of trenches, stockades, and small forts. The surrounding country was the centre of insurgent operations during the revolution, and only 16 miles north of the city lies Cubitas, the capital of the revolutionary government from 1896 to 1898.

PUERTO REAL, rȧ-äl′. A town of southwest Spain, in the Province of Cadiz, situated at the head of the Bay of Cadiz, 5 miles east of the city of that name. It is a well-built modern town, founded in 1488 on the site of the old Roman Portus Gaditanus. It has a harbor with a steamship pier and a dry dock, and manufactures textiles, cements, and salt. Pop., 1900, 9683; 1910, 8360.

PUERTO RICO, rē′kō. See Porto Rico.

PUFENDORF, pụf′en-dôrf, Samuel, Baron (1632–94). A German publicist, born at Chemnitz in Saxony. He began the study of theology at Leipzig, but speedily turned to the subject of public law, which he pursued at Jena till 1657. In 1658 he became tutor in the family of Petrus Coyet, Swedish Minister at Copenhagen, and in 1660 went with his patron to The Hague, where he published his *Elementa Jurisprudentiæ Universalis* (1660). This led to his being summoned to the University of Heidelberg, where the first chair of the law of nature and of nations was created for him. In 1667 he published, under the pseudonym of Severinus de Mozambano, *De Statu Imperii Germanici*, a merciless analysis of the anachronisms and absurdities of the Imperial constitution. This work aroused great attention and brought the author much fame and many enemies. In 1670 Pufendorf followed a call to the Swedish University of Lund. There he wrote the valuable *De Jure Naturæ et Gentium* (1672) and *De Officio Hominis et Civis* (1673). In 1677 he became Councilor of State and royal historiographer to the King of Sweden. There followed a number of important works: *Einleitung zur Historie der vornehmsten Reiche und Staaten* (1682); *De Rebus Suecicis* (1686); *De Rebus a Carolo Gustavo Gestis* (1688). In *De Habitu Christianæ Religionis ad Vitam Civilem* (1687) he upheld the right of the state as against the church. He went to Berlin in 1686, summoned by the Great Elector of Brandenburg, and after the latter's death in 1688 was made by his successor Privy Councilor. He died in Berlin Oct. 26, 1694. The *De Rebus Gestis Friderici Wilhelmi Magni* and *De Rebus Gestis Friderici III* appeared the year after his death. Consult H. von Treitschke, "Samuel von Pufendorf," in *Preussische Jahrbücher* (Berlin, 1875), and Droysen, "Zur Kritik Pufendorfs," in *Abhandlungen zur neueren Geschichte* (ib., 1876).

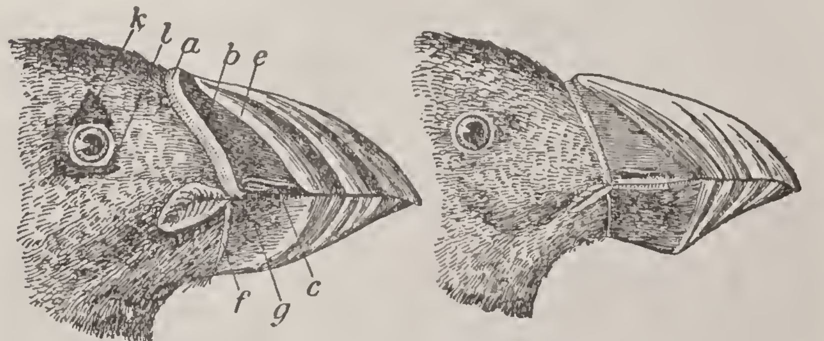
PUFF ADDER. An African viper (*Bitis*, or *Clotho, arietans*), which takes its name from its habit of lifting its head when approached and menacing the enemy by hissing loudly with a puffing sound. It is a typical viper, but has an unusually broad, triangular head, due to the excessive size of its poison sacs, and its bite is very dangerous. It attains a length of 4 to 5 feet and is often as thick as a man's arm. Its color is yellowish brown, checkered with reddish brown and white, making it very difficult to see as it lies on the ground. Its movements are generally slow and its habits are those of vipers generally. It is found all over Africa except along the Mediterranean coast. Consult C. C. Hopley, *Snakes* (London, 1882), and especially F. W. FitzSimons, *The Snakes of South Africa* (Cape Town, 1912). See Colored Plate of Foreign Venomous Serpents under Snake.

PUFFBALLS. The common name of a species of *Lycoperdon*, referring to the characteristic globular spore-producing bodies, which sometimes reach 20 inches in diameter. These bodies arise from an extensively branching mycelium (q.v.), and when young are white and fleshy within, in this condition being included among the edible mushrooms. When mature the covering (peridium) becomes dry and parchment-like, and the innumerable minute spores are discharged in clouds through an opening in the apex. See Basidiomycetes; Mushroom.

PUFF BIRD. A member of the family Bucconidæ. These take their name from their habit of sitting motionless on a perch for hours at a time with their feathers raised until the bird looks like a puffball. At the first alarm the feathers flatten instantly. See Barbet, and Plate of Trogon, Hoopoe, etc.

PUFFER. See Globefish, and Plate of Plectognath Fishes.

PUFFIN (so called from its puffed-out beak). An auk of the genus *Fratercula*, characterized by the high, compressed form of the beak. The best known is the common one (*Fratercula arctica*) of the Arctic and north temperate regions generally, which migrates southward in winter as far as Spain and Long Island. It is a little larger than a pigeon; the forehead, crown, back of the head, a collar round the neck, the back, wings, and tail are black, the other parts of the plumage white. The puffin lays only a single egg in a burrow or some natural hole in a cliff face, where great numbers congregate and behave like auks and guillemots (qq.v.). The eggs and young birds are sought



BEAK OF PUFFIN (*Fratercula arctica*).

The left-hand figure shows the appearance of the beak of the male in the breeding season, at the close of which all the parts lettered are separately molted. The appearance of the beak in the non-breeding season (winter) is shown in the right-hand figure.

after by fowlers for food. Other species are found in the Arctic and North Pacific oceans, coming to California in winter. Among the most notable are the crested puffin (*Lunda cirrhata*), which has a long tuft of feathers on each side of the head, and the tufted puffin (*Fratercula corniculata*). This might more suitably be called horned puffin, as each of its upper eyelids bears a slender, upright, acute horn (see Plate of Auks, Albatross, etc.), which, however, is only an appendage of the male in the breeding season and drops off at its close, just as the special coatings and appendages of the beak and eyes in some other puffins are acquired in the spring and molted in the fall.

PUG (variant of *puck*, from Ir. *puca*, Welsh *pwca*, *pwci*, goblin, sprite). A small, smooth, short-nosed house dog, introduced into England probably from Holland, to which country it seems to have come, according to general testimony, from the East Indies. The breed was well established in England by the year 1700, and continued so from the reign of William II to George II. By the first quarter of the nineteenth century pugs had nearly or quite disappeared from Great Britain. The fawn variety was reintroduced from Holland, and now there are two recognized strains—the fawn and the black (the latter brought from China about 1875 by Lady Brassey). An inferior quality has long been bred in Italy and in France, where they were called carlins, after a celebrated Harlequin. The pug is essentially a house dog and a very good one, and for that purpose a smaller dog than the standard allowed in competition (13 to 17 pounds) is the better. The general appearance is that of a large-headed, smooth-coated, black-faced, pug-nosed, bright little dog, compact in form, with well-knit proportions and well-developed muscles. In color he is (in the ordinary variety) fawn all over, except on the muzzle or mask, the ears, the moles on his cheeks, the thumb mark or diamond on his forehead, and his back trace, which should all be as black as possible. His face is deeply wrinkled, and he carries his tail curled as tightly as possible over his hips. His coat must be short, smooth, soft, and glossy, neither hard nor woolly.

The black pug differs only in color; he is entirely black.

PUGAREE. See Pugree.

PUGATCHEV, pōō′gȧ-chĕf, Emelyan Ivanovitch (c.1726–75). A leader of a great popular uprising in Russia, known as Pugatchevshtchina. He was a Cossack of the Don and fought against the Prussians in the Seven Years' War and in the campaign against Turkey in 1769. On his return he was arrested for helping his brother-in-law to escape across the Don. Fearing punishment, he ran away to the Cossacks of the Terek, where he heard persistent rumors that Peter III was still alive. Strikingly resembling the murdered Czar in personal appearance, he pretended to be that sovereign and declared his purpose of reasserting his right to the crown and of dethroning Catharine II. He issued a proclamation in the name of Peter III in 1773, and in the same year the rebellion began. He attached the Raskolniks to his cause and won over several Finnish and Tatar tribes and a large number of the peasantry. After the capture of many fortresses on the Ural and the Don, Orenburg among them, he marched against Moscow, but was sold by some of his companions. After trial he was executed in Moscow. His insurrection, which is said to have cost 100,000 lives, has been described by the poet Pushkin and by Dubrovin.

PUGET, pụ′zhȧ′, Pierre (1622–94). A French sculptor, painter, and architect. He was born at Marseilles, Oct. 31, 1622. At the age of 14 he was apprenticed to a wood carver, employed in the decoration of ships, and at about 18 he went to Florence and to Rome. He became an assistant of Pietro da Cortona (q.v.). From the first Puget was subjected to the powerful influence of the Italian baroque. From 1650 to 1665 he devoted himself principally to painting pictures, some for the churches of Marseilles and other cities of southern France. There is record of 56 pictures by him, 19 of which are still in existence, including three portraits of himself.

His first important works in stone are the famous pair of male caryatids (1657) on the portal of the façade of the hôtel de ville at Toulon. In 1659 he went to Paris and made three fine figures for the château of Vaudreuil in Normandy. Fouquet engaged him to assist in the decoration of his new château at Vaux-le-Vicomte. In 1660 he went to Genoa and made for Fouquet his celebrated statue "The Gallic Hercules," now in the Louvre. The next seven years in Genoa were the most successful of his entire career. For Francesco Sauli he carved statues of St. Ambrose and St. Sebastian in the church of Santa Maria di Carignano, the former being especially fine. He carved also a statue of the "Conception" in the Albergo de' Poveri (1664), the great altar of the church of the Theatines (finished 1670), and probably assisted J. B. Carlone in painting the dome of this church. After 1668 Puget divided his time between Marseilles, Toulon, and Genoa. The French government employed him in the decoration of ships. In Marseilles Puget helped to reconstruct the old city. His reputation rests chiefly upon two powerful works executed during this period—the statue of Milo of Crotona and the great bas-relief of Alexander and Diogenes, both in the Louvre.

Consult the biographies by Léon Lagrange (Paris, 1868), Charles Ginoux (ib., 1894), and Philippe Auquier (ib., 1903). For his decorative work, consult Auquier, *Pierre Puget, décorateur naval et mariniste* (ib., n. d.).

PUGET (pū′jĕt) **SOUND.** A large, irregular, and many-branched inlet extending into the northwestern part of the State of Washington from the head of the Strait of Juan de Fuca (Map: Washington, C 3). From the south end of Whidbey Island, at its mouth, it extends southward for about 35 miles and then southwestward for about 30 miles. This main arm (on the east) is called Admiralty Inlet. From the same point another inlet, called Hood Canal, extends southward for 44 miles and then turns abruptly northeastward for 11 miles. The east shore of Admiralty Inlet has few considerable indentations; the principal ones are Elliott Bay, the port of Seattle, and Commencement Bay, the port of Tacoma. On the west shore is Port Orchard (opposite Seattle), which is the site of the Puget Sound Navy Yard. The south extremity expands into a maze of inlets and passages, the southernmost of which, Budd Inlet, is the approach to Olympia (q.v.). Port Townsend is at the west entrance to the sound. The shores of Hood Canal are abrupt, high, and wooded, and afford some very picturesque scenery. Throughout the sound the water generally is deep, and in places exceedingly so, while the tides are erratic and complex. Consult E. S. Meany, *Vancouver's Discovery of Puget Sound* (New York, 1915).

PUGET SOUND, College of. An institution for higher education at Tacoma, Wash., founded in 1903 as the University of Puget Sound. In 1914 it was given its present title, and it was reorganized to harmonize with the name. There is a college grade, with an affiliated college preparatory. There is also offered an advanced normal-school course, which is accredited by the State Board of Education. The total enrollment in 1914–15 was about 400. The faculty in the college and preparatory school numbered 22. The total valuation of the grounds and equipment in 1915 was $139,842, and the yearly income was about $40,000. During 1915 a campaign for raising $250,000 for an endowment was in progress. The library contains about 7000 volumes. The president in 1915 was Edward H. Todd.

PU'GILISM. See Boxing.

PUGIN, pū'jĭn, Augustus (1762–1832). An English architect and writer on architecture. He was born in Normandy, but during the French Revolution went to London, where he was educated at the Royal Academy. He is known chiefly by his works on mediæval architecture. He published: *Microcosm of London* (1808; reissue, 3 vols., 1904), with T. Rowlandson; *Specimens of Gothic Architecture* (1821–23); *Architectural Illustrations of the Buildings of London* (1825), with John Britton; *Examples of Gothic Architecture* and *Gothic Ornaments* (1831). In *Specimens of the Architectural Antiquities of Normandy* (1827), his best work, as also in his *Gothic Ornaments*, he was assisted by his son, A. W. N. Pugin.

PUGIN, Augustus Welby Northmore (1812–52). An English architect and designer, born in London. He was a pupil of his father, Augustus Pugin. After he became a Roman Catholic, A. W. N. Pugin designed a large number of buildings for his church in England, including the Roman Catholic cathedral, London. He is probably the most important of the architects connected with the revival of Gothic architecture in England during the nineteenth century, which he promoted as much by his books as by his buildings. Among his writings are: *Contrasts: A Parallel between the Noble Edifices of the Fourteenth and Fifteenth Centuries and the Present Day* (1836); *True Principles of Pointed or Christian Architecture* (1841); *Apology for the Revival of Ecclesiastical Architecture in England* (1843). His son, Edwin Welby Pugin (1834–75), completed a number of his father's designs and buildings.

PUGLIA, pōō'lyȧ, La. The modern Italian form of the name of Apulia (q.v.), Italy.

PUG MILL. See Clay.

PUGNO, pụ'nyō', Raoul (1852–1914). A French pianist, born at Montrouge, near Paris. He received the rudiments of his musical education from his father, a music teacher. At the age of six Raoul competed with a large class of boys for entrance into the Paris Conservatory and headed the list of successful competitors. He graduated, taking the first prize, and also first prize in harmony, in the counterpoint and fugue class of Ambroise Thomas. In 1896 he was appointed professor of piano at the Conservatory, and in 1897–98 he toured the United States with Ysaye (q.v.), showing himself an ensemble player of the first rank. His subsequent tours, when he appeared as soloist with orchestra and in recitals, proved that he was among the greatest masters of his instrument. His compositions include an oratorio, *La résurrection de Lazare* (1879); the comic operas *Ninetta* (1882) and *Le Sosie* (1887); *Le retour d'Ulisse* (1889); operetta, *La petite Poucette* (1891); and many pianoforte pieces, vocal music, and chamber music.

PUGREE, pŭg'rē, or **PUG'AREE** (Hind. *pagri*, turban). A long, light-weight, silk or muslin cloth wound round the headgear, or helmet, in tropical countries. As its origin indicates it was first used by British soldiers serving in India, but is now part of the clothing equipment of all British soldiers serving abroad, and likewise of soldiers of other nationalities serving in tropical climates.

PUINAVIAN, pwē-nä'vĭ-*a*n. The language of the tribe of Puinavis who live on the Inirida River, an affluent of the Guaviare River in Colombia, South America. The language appears to be without affinities. A vocabulary of 53 words collected by Crivaux and one by Montolieu of 60 words will be found in *American Anthropologist*, vol. viii (Washington, 1895). Consult also D. G. Brinton, *The American Race* (New York, 1891).

PUISET, pwē-zä', or **PUDSEY,** Hugh de (c.1125–95). An English Bishop of Durham and Earl of Northumberland, born in France, a nephew of King Stephen. He came to England in his teens, became archdeacon to his uncle, Henry of Blois, and in 1143, being appointed treasurer of York, entered his long career in the ecclesiastical politics of the North. In it he was greatly assisted by Adelaide de Percy, long his mistress. In 1153, after a bitter struggle, Hugh became Bishop of Durham; but in temporal politics he took little part until 1174, when he attempted to join the rebellion against Henry II. With the accession of Richard I he came into new prominence because of his opposition to the King's nomination of Geoffrey for the archiepiscopate of York and because of his purchase of the earldom of Northumberland. With Longchamps he had a long quarrel as to who should be chief justiciar and was finally worsted. Gradually he fell out with Richard also, and in 1194 found it good policy to surrender his earldom. Puiset died on his way to negotiate with the King for his lost offices. It was under his orders that the *Boldon Buke*, or Durham Domesday Book, edited by Greenwell (1832), was drawn up.

PUISEUX, pụ'ē-zē', Pierre Henri (1855–1912). A French astronomer, born in Paris. He attended the Ecole Normale Supérieure and became a doctor of science in 1879, offering a remarkable thesis on *L'Accélération séculaire du mouvement de la lune*. Afterward he lectured at the Sorbonne and was appointed professor in the Faculty of Sciences. From 1907 to the time of his death he was in charge, at the Paris Observatory, of charting the sky. He wrote the standard *Cours de Cinématique*, and the important treatise, *La terre et la lune*. With Loewy he collaborated on *L'Atlas photographique de la lune*.

PUISNE (pū'nē) **JUDGES** (OF. *puisne*, Fr. *puîne*, junior, from ML. *postnatus*, later-born, from Lat. *post*, after + *natus*, born, p.p. of *nasci*, to be born). Associate judges of the King's Bench Division of the High Court of Justice of England and other divisions of the High Court in Great Britain and associate judges in India and other British colonies. The term "puisne" was first employed, on the permanent establishment of the Court of Common Pleas at Westminster, to designate the associate judges as distinguished from the Chief Justice, who presided over the court. Later the term was applied to the associate justices of the other courts, as the "puisne judges of Queen's Bench Division" and "puisne Barons of Exchequer." At present in England the Lord Chief Justice presides over the King's Bench Division, and serving with him are 14 puisne judges. In India puisne judges preside in the courts of various cities and districts. See Court.

PUJO, pụ'zhō', Arsène Paulin (1861–). An American legislator, born at Lake Charles, La. He studied law privately, was admitted to the bar in 1886, and entered politics as a Democrat, serving as a member of the Louisiana Constitutional Convention in 1898. Elected to the National House of Representatives in 1902, he served therein continuously until 1913. In Congress probably his most important activity was in connection with the Committee on Banking and Currency, of which he was chairman from 1911 to 1913. This committee was empowered to make an investigation of the banking and financial systems of the country, the inquiry being known as the Pujo or Money Trust investigation. The results of its efforts had important effects upon the Glass-Owen Currency Act and the Clayton Anti-Trust Law. Although much criticized as being partisan and political in nature, the report in 1913 pointed out the evils of interlocking directorates and the fact of the increasing concentration of the control of money in the hands of a few men. In 1912 Pujo was unsuccessful as a candidate for the Democratic nomination for Senator from Louisiana.

PUKET, po͞o'kĕt', or Tonka. A Siamese port on Salang or Junkseylon Island, off the west coast of the Malay Peninsula (Map: Siam, C 5). It is noted principally for its tin mines, the annual production being estimated at more than 3500 tons. Pop., about 20,000.

PUKHTU, pụk-to͞o'. See Afghan.

PULANGUI, pụ-län'gē̇, or Río Grande de Mindanao. The largest river of the Philippine Archipelago. It rises near the north coast of Mindanao and flows southward as far as Lake Liguasan, whence it turns northwest and empties into the Bay of Illana at Cotabato (Map: Philippine Islands, E 7). It is over 200 miles long, navigable 70 miles for vessels drawing 3½ feet.

PULASKI, pů-lăs'kī. A town and the county seat of Giles Co., Tenn., 78 miles by rail south by west of Nashville, on the Louisville and Nashville Railroad (Map: Tennessee, C 4). It has the Martin Female College and the Massey School for Boys. Pulaski is situated in a productive agricultural and stock-raising district and has important lumber, trucking, poultry, and egg interests. Pop., 1900, 2838; 1910, 2928.

PULASKI, pů-lăs'kī. A town and the county seat of Pulaski Co., Va., 59 miles west of Roanoke, on the Norfolk and Western Railroad (Map: Virginia, D 4). The town is an attractive mountain resort and has a fine high-school building. The chief business is the smelting of zinc and iron ores from the surrounding region. There are several zinc furnaces, iron furnaces, and a large sulphuric acid plant. Pop., 1900, 2813; 1910, 4807.

PULASKI, po͞o-läs'kē̇ (Pol. *Pulawski*, po͞o-läv'skē̇), Casimir (1748–79). A Polish soldier in the American Revolution. He was born in Podolia, Poland, the son of Count Joseph Pulawski. Casimir joined enthusiastically in the movement to liberate his country and fought heroically in the unequal struggle against the Russians, rising to the rank of commander in chief of the patriot forces. He was accused unjustly of complicity in the plot to abduct King Stanislas Poniatowski from Warsaw (1771), was outlawed and deprived of his estates. Escaping to Turkey, he passed thence to France, where he was induced by Franklin and the French ministry to assist the Americans against England. He arrived in Philadelphia in 1777, served first as a volunteer, and then, for his gallantry at the battle of Brandywine, was appointed chief of dragoons with the rank of brigadier general. In 1778, with the sanction of Congress, he organized an independent corps of cavalry and light infantry. With this body, called Pulaski's Legion, he was ordered to South Carolina. He reached Charleston on May 9, 1779, and soon afterward led an unsuccessful sortie against the British, under Prevost, before the city. Later in the same year he commanded the French and American cavalry at the siege of Savannah and during the attack of October 9 was mortally wounded. Consult Jared Sparks, "Life of Count Pulaski," in *American Biography*, vol. iv (new ed., New York, 1902); M. I. J. Griffin, *General Count Casimir Pulaski* (Philadelphia, 1910).

PULCHERIA, pŭl-kē'rĭ-ȧ, Saint (c.399–453). A Byzantine empress, the oldest daughter of the Emperor Arcadius. In 414 she became coruler with her brother, Theodosius, who was content to leave the management of affairs in her hands. She governed wisely, was active in condemning the Nestorian and Eutychian heresies, and promoted virtue and piety. About 446 she withdrew from the court, but after the death of Theodosius (450) she resumed the direction of the government. Early in life she took a vow of virginity, but now, having been absolved from her vow for state reasons, she married the general Marcian. Her feast is September 10 in the Latin church, but August 7 in some of the Oriental calendars. Consult A. Güldenpennig, *Geschichte des öströmischen Reichs unter Arkadius* (Halle, 1885).

PULCI, pụl'chē̇, Luca (1431–70). An Italian poet, elder brother of Luigi Pulci. He wrote the *Pistole*, love letters in tercets; the *Driadeo d'amore*, a mythological poem in octaves, its material an Ovidian fable, and began the *Ciriffo Calvaneo*, a chivalrous poem in octaves, which was continued by Luigi. Consult the *Pistole* in the edition of Florence, 1481; the *Driadeo* in Torraca's *Poemetti mitologici* (Leghorn, 1888); the *Ciriffo* in the edition of Florence, 1834.

PULCI, Luigi (1432–84). An Italian poet, born at Florence of a family once wealthy and noted in the fifteenth century for its literary attainments. Both Cosimo and Piero de' Medici were his patrons and friends, and he was on terms of intimacy with Lorenzo the Magnificent. Pulci's chief work is the romantic, chivalrous poem called by him the Morgante when he published 23 cantos of it at Venice in 1482 and known as the *Morgante maggiore* since the appearance of the second and complete edition of it at Florence in 1483 (28 cantos). The great value of the *Morgante* consists in the fact that it was the first artistic treatment in Italian of the chivalrous stories of Charlemagne and his peers so long before imported from France. It takes its name from the giant Morgante, who is converted to Christianity and accompanies Orlando (Roland) on some of his expeditions. The first canto of his poem was translated into English octaves by Byron. Pulci's other poetical works comprise the *Confessions,* which has somewhat the air of a parody on the Scriptures; the *Beca di Dicomano,* a burlesque imitation of the *Nencia da Barberino* of Lorenzo the Magnificent; his revision of the *Ciriffo Calvaneo* of his brother Luca, and the *Giostra* ascribed to Lorenzo de' Medici; some *Strambotti,* some satirical and jocose sonnets, and other shorter lyrics. In prose he wrote the *Lettere a Lorenzo il Magnifico* (Lucca, 1886) and a novel. There are several editions of the *Morgante,* one of 1900–04 edited by Volpi (Florence); the *Confessione,* the *Beca,* and the sonnets may be found in the editions of Lucca, 1759. Consult Volpi, "Luigi Pulci, studio biografico," in the *Giornale storico della letteratura italiana,* vol. xxii (Turin, 1893), and the *Life* prefacing Bongi's edition of the *Lettere* (Lucca, 1886); F. Foffano, *Il Morgante di L. Pulci* (Turin, 1891).

PULILAN, pụ-lē′lȧn. A town of Luzon, Philippines, in the Province of Bulacán, situated 5 miles north of Malolos. Pop., 1903, 9665.

PU′LITZER, Joseph (1847–1911). An American journalist, born in Budapest, Hungary, April 10, 1847. His father was a Jew and his mother a Roman Catholic. In his boyhood he had only such education as could be gained within a short period from a private tutor. At 17 he emigrated to the United States, where in the same year (1864) he enlisted in the First New York Cavalry to serve in the Civil War. At the close of the war, unable to get work in New York, he managed to reach St. Louis. Here he became successful as a reporter on Carl Schurz's *Westliche Post,* a German Republican paper. Of this he later (1871) became managing editor and part owner. He also studied law and was admitted to the Missouri bar. In 1869 he had been elected to the State Legislature, and he was a member of the Missouri Constitutional Convention of 1874. In national politics Pulitzer gained a name when as a delegate to the Liberal Republican convention in 1872 he vigorously supported the nomination of Horace Greeley for the presidency. But later he allied himself definitely with the Democratic party, and as a consequence severed his connection with the *Westliche Post.* In 1876–77 he was in Washington as correspondent of the New York *Sun,* Charles A. Dana having selected him to report the proceedings of the Electoral Commission, and soon afterward he went to Europe as a special correspondent of the same paper. In 1879 he bought the St. Louis *Evening Dispatch* and *Evening Post,* combined them as the *Post-Dispatch,* and built up a flourishing plant. But although he continued to control this paper, Pulitzer's great work was in the development of the New York *World,* which he acquired from Jay Gould in 1883. From then until the presidential election of 1884 he championed Grover Cleveland's candidacy, proving himself an important factor in the Democratic success. In 1884 he was elected to Congress, but he resigned after three months. The *World* under his direction struck out on pioneer lines of appeal to popular taste. Crisply and ably written news columns, straightforward, purposeful, and unacademic editorials, and a frank policy of featuring, for the sake of "human interest," stories of a sensational character, built up a circulation that had no rival until the advent of the Hearst papers. Although a man of extraordinary energy, Pulitzer broke down in 1887 from overwork. And even after this, an invalid, blind, and absent on long cruises in his steam yacht, he exercised a minute supervision over all the affairs of the *World.* In 1903 he announced that he would bequeath to Columbia University $1,000,000 to build and endow a school of journalism and would provide that an additional million be turned over if after a specified period the school was in successful operation. Classes were instituted in 1912, and the building was finished in 1913, Mr. Pulitzer having died Oct. 29, 1911. To the Philharmonic Orchestra of New York he left $500,000. His estate was appraised at more than $20,000,000. Ralph Pulitzer succeeded his father as owner of the *World.* Consult J. L. Heaton, *The Story of a Page* (New York, 1913); also Alleyne Ireland, *Joseph Pulitzer* (ib., 1914).

PULKOVA, pụl′kō̇-vȧ. A village in the Government of Saint Petersburg, Russia, situated on a high ridge, about 10 miles southwest of the capital. It is noted as the site of the principal observatory of Russia.

PULLET. One of the many provincial names for the British edible clam (*Mya truncata*). See Clam, and accompanying Colored Plate.

PULLEY (OF., Fr. *poulie,* probably from LGer. *pullen,* AS. *pullian,* Eng. *pull*). A circular wheel turning on a smooth axle through its centre and with a groove cut in its rim so that a cord can run around it. A fixed pulley is one whose axle is fixed to some support, while a free pulley is not stationary, but is carried in the bight of the cord passing over it. A fixed pulley simply changes the direction of the force which the cord exerts. If in Fig. 1 F_1 and F_2 are two forces acting on a cord passing over a pulley, they will be equal if the system is in equilibrium.

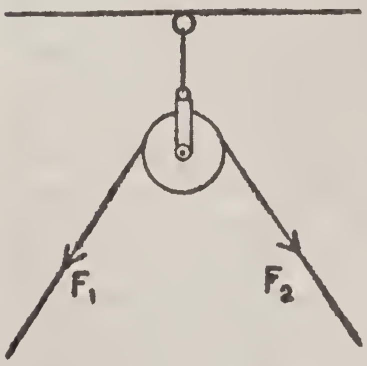


Fig. 1.

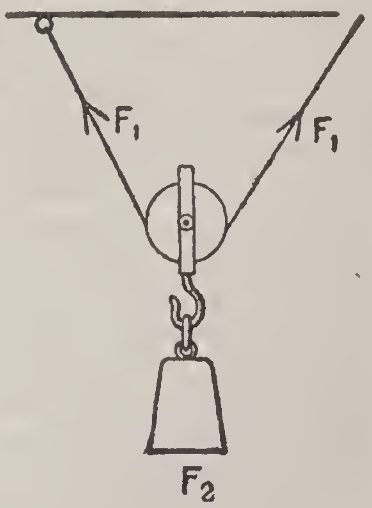


Fig. 2.

If a free pulley carrying a weight is supported by a cord, as shown in Fig. 2, there are three forces acting on the pulley, a force F_2 vertically down, equal to the weight of the pulley and the weight it carries, and two forces obliquely upward, each equal to F_1, due to the two branches of the cord which passes over the pulley. If the branches of the cord make an angle θ with the vertical, $2F_1\cos\theta$ is the total force acting vertically upward; therefore if there is equilibrium $2F_1\cos\theta = F_2$; and the mechanical advantage, $\frac{F_2}{F_1}$ is $2\cos\theta$. In particular, if, as is usually the case, the two branches of the cord are parallel and vertical, $\theta = 0$ and $2F_1 = F_2$.

Fixed and free pulleys may be combined in many ways, but the principle is evident. If a continuous cord passes over a free compound pulley made up of several independent wheels, in such a manner that there are n supporting branches of the cord, the mechanical advantage is n.

Pulleys are also made in which two toothed wheels of different radii are clamped together, so that as one turns the other must also; and the cord is replaced by a chain whose links fit into the teeth. Such a pulley is called a differential one. If one wheel has in its rim N teeth and the other $N - 1$, the mechanical advantage is $2N$.

The principle of the action of pulleys was first given by Stevinus. See Block; Tackle.

PULL′MAN. A city in Whitman Co., Wash., 80 miles south of Spokane, on the lines of the Oregon-Washington Railroad and Navigation Company and the Northern Pacific (Map: Washington, H 4). It is the seat of the State College and contains a United States government experiment station. The surrounding country is engaged chiefly in dairying and the growing of live stock and grain. The city has many artesian wells, one of which flows 2400 gallons a minute. Pop., 1900, 1308; 1910, 2602.

PULLMAN, George Mortimer (1831–97). An American inventor, born in Chautauqua Co., N. Y. He worked for a time as a cabinetmaker with an elder brother in Albion, N. Y., and in 1853 took a contract for moving buildings that obstructed the widening of the Erie Canal. In 1859 he removed to Chicago, where he did business as a building contractor. In the same year he remodeled two old coaches into sleeping cars, and in 1863 he built the first new sleeping car, "Pioneer," upon the lines of the cars now in use throughout the United States. Of the Pullman Palace Car Company, which he organized in 1867, he was president until his death. He founded (1880) for his employees the model town of Pullman, Ill., and attempted to make the place an ideal home for his men. However, the company insisted on exercising sole control, and at last the residents, dissatisfied with the high rates charged for rent, water, and gas, voted (1889) in favor of annexation to Chicago. The Pullman employees were the ones who precipitated the great American railroad strike of 1894 by their stand for higher wages and shorter hours. In 1887 he invented and put into execution the idea of vestibule trains, and introduced also the dining car on the Union Pacific Railroad.

PULLMAN CARS. See Railways.

PUL′MONA′TA (Neo-Lat. nom. pl., from Lat. *pulmo*, lung). An order of air-breathing gastropod mollusks having no gills, but the mantle cavity modified into a respiratory sac or lung, with a contractile opening under the margin of the mantle. Those forms which live in the water are obliged to obtain their air supply at the surface. The heart has only one auricle and that usually lies in front of the ventricle. The nerve cords connecting pleural and visceral ganglia are not crossed. The Pulmonata are either land or fresh-water forms, except *Onchidium*. They are all hermaphroditic. The number of known species runs up into the thousands, and though they are found in all temperate regions, they abound especially in certain tropical islands, as Jamaica and the Hawaiian Islands. In America the order is represented by many species of land snails, slugs, and pond snails. Few species reach a large size, and most have rather plainly colored shells. See Snail.

PULMOTOR, pŭl′mō′tẽr. A mechanical device for carrying on prolonged artificial respiration and used in cases of gas asphyxiation, drowning, and for the resuscitation of newborn infants and victims of electric shock. Several types of such apparatus are made, notably the pulmotor, the Brat apparatus, the lung motor, and the salvator. In the pulmotor the inspired air is said to contain 60 per cent of oxygen, while in the apparatus of Dr. Brat pure oxygen is used. In the latter device the respiratory changes are made by hand; the pulmotor works by an automatic mechanism. A committee of scientists appointed to study the subject of resuscitation from mine gases finds that the pulmotor is not without its dangers, and is of the opinion that the device has been the subject of systematic exploitation in the United States and is rated far beyond its actual worth. Many cases of resuscitation reported in the lay press were investigated, but the accounts were so indefinite that no conclusions could be drawn from them. In testing the instrument on animals the committee found that the air or oxygen was often pumped into the stomach and that inspiration and expiration were easily interchangeable. They also found that with these machines, expiration is accompanied by a process of suction which is not physiological, and there was a tendency to suck the air out of the alveoli and small bronchi, resulting in their complete collapse. These and other observations indicate that the pulmotor in the hands of the unskilled may prove a lethal rather than a lifesaving apparatus. None of these instruments should be used for more than a few minutes at a time, and the intervening periods should be given up to the employment of one of the manual methods of artificial respiration. When the patient is breathing even very slowly his removal to a pure atmosphere is usually sufficient. Consult *Report of the Committee on Resuscitation from Mine Gases*, Technical Paper 77, Bureau of Mines (Washington, 1914). See Respiration, Artificial.

PULP INDUSTRY. See Lumber Industry.

PULPIT (from Lat. *pulpitum*, platform, rostrum). A piece of church furniture used for the delivery of sermons. In the first Christian ages, when the bishops were practically the only preachers, they delivered their addresses from the episcopal throne at the end of the apse; hence a pulpit is called *chaire* in French to this day. Then the ambo (q.v.) was sometimes used for this purpose, and later the jubé or rood loft between the choir and the nave. By the eleventh or twelfth century small movable pulpits had been introduced, which could be brought out at the time of the sermon; and by degrees the modern pulpit was evolved. There are some excellent mediæval examples in Italy, among them one at Ravello elaborately decorated with mosaic, two very fine ones by Nicola Pisano at Pisa and Siena, and another by his son Giovanni at Pistoia. Among Renaissance pulpits one of the finest is that by Benedetto da Majano in Santa Croce at Florence. The most ancient pulpits extant in France are supposed to be not earlier than the fifteenth century. The nonliturgical churches usually use a desk set in the middle of a platform facing the audience.

PULQUE, pụl′kȧ (Sp., from Aztec *octli*). A favorite beverage of the Mexicans and of the inhabitants of Central America and some parts of South America. It is made from the juice of different species of agave (q.v.). Consult C. S. Brown, "The National Drink of Mexico," in *Overland Monthly*, N. S., vol. xxxvi (San Francisco, 1900).

PUL′SATIL′LA. See ANEMONE; PASQUE FLOWER.

PULSE (Lat. *pulsus*, a beating, from *pellere*, to drive). The rhythmical expansion of the arteries due to the blood waves caused by successive contractions of the heart. The arteries are elastic tubes and into them is injected at each contraction of the heart ventricles from two to four ounces of blood. As a consequence an already full but contracted artery becomes distended, lengthened, and uplifted, giving rise to the sensation in the examining finger which is called the pulse. The pulse wave due to any given beat of the heart is not perceptible at the same moment in all the arteries of the body. The difference in time is proportioned to the distance of the arteries from the heart and rarely amounts to more than one-eighth or one-sixth of a second. The pulse is usually felt at the radial or thumb side of the wrist, the artery being near the surface at this point and easily compressed against the bone. It may, however, be perceived in many other situations.

The pulse rate varies greatly in health according to age, sex, temperament, exercise or rest, emotional states, temperature, time of day, posture, atmospheric pressure, and personal idiosyncrasy. Before birth the average number of pulsations each minute is 150; in the newly born, from 140 to 130; during the first year of life, 130 to 115; during the second year, 115 to 100; about the seventh year, 90 to 85; about the fourteenth year 85 to 80; in adult life, 80 to 70; in old age, 70 to 60; in decrepitude, 75 to 65. In the female and in persons of a sanguine temperament the pulse rate is more rapid by several beats in the minute than in males and individuals of a phlegmatic type. The rate is also higher after a meal and during exercise. The pulse is more rapid in the evening than in the morning and in the standing than in the sitting or recumbent posture; high temperatures also accelerate it. During sleep the pulse is usually slower than in the waking state. Forty is not an uncommon rate, and instances have been known in which the pulsations were only 30 or more rarely 20 to the minute.

In disease the pulse presents wide variations in rate, regularity, volume, and tension, and is a valuable guide in diagnosis and in estimating the physical condition of the patient, and disturbances of its relation to respiration and temperature are always significant. Excessive slowness of the pulse (bradycardia) occurs in some diseases of the heart, in conditions of collapse, in meningitis, in cerebral tumors, and in jaundice. Bradycardia is also observed in convalescence from acute fevers and is probably an expression of exhaustion. As a physiological phenomenon bradycardia occurs in the puerperal state and in hunger. As a general rule in disease the pulse is more apt to be abnormally fast (tachycardia) than slow. Nearly every disturbance of health tends to quicken the pulse; rapid heart action is the constant accompaniment of acute inflammation, of fever in all forms, and of most heart diseases. When the intervals between successive beats of the heart are not of uniform length, the pulse is said to be irregular. A pulse intermits when a beat is dropped at intervals. In pulsus alterans there is a strong beat followed by a weak one; in pulsus bigeminus the beats occur in twos; in pulsus trigeminus, by threes. Pulsus paradoxus consists in the diminution or total disappearance of the pulse during inspiration, and is a very rare occurrence.

The pulse is said to be full when the volume is greater than usual, and small or contracted under the opposite condition. Fullness may depend on general plethora and on prolonged and forcible contractions of the left ventricle of the heart; a small pulse results from general deficiency of blood, from feeble action of the heart, congestion of the venous system, or exposure to cold. When very small it is termed threadlike.

The tension or hardness of the pulse is estimated by the degree to which it resists compression. A hard pulse can scarcely be stopped by any degree of pressure by the finger. Hardness is favored by a powerfully acting heart, a normal amount of blood, and contraction of the peripheral blood vessels, as e.g., by cold. Softness of the pulse is favored by a feeble heart, by valvular imperfections interfering with the supply of blood to the arterial system, and by a free flow through the capillary area. A hard pulse is usually indicative of inflammation and a soft or compressible pulse of general weakness.

The blood from the veins returns to the heart under normal conditions in a steady stream, the pulse being lost in the capillary area. Some pulsation, however, can often be seen in the larger veins near the heart, the jugular veins, e.g., in many persons with a healthy circulation. The expansion of the vein is synchronous with dilatation of the ventricles, and collapse with contraction. Another kind of pulsation, in which this relation is reversed, takes place when the tricuspid valves guarding the veins become insufficient through disease. A wave of blood is sent back into the venous trunks, producing a visible pulsation. This phenomenon may also be produced by hypertrophy of the right auricle and aneurism of the aorta.

An instrument has been devised by which the variations of the pulse can be indicated upon paper attached to a revolving cylinder. See ARTERY, *Diseases of the Arteries;* BLOOD PRESSURE; HEART, DISEASES OF THE; PULSIMETER.

PULSIM′ETER (Neo-Lat., from Lat. *pulsus*, pulse + Gk. μῆτρον, *mētron*, measure). An apparatus used to record the force and rapidity of the pulse beat. Such an instrument for the radial artery is called the sphygmograph, the graphic tracing made being called the sphygmogram. For recording the electrical changes caused by the contraction of the heart muscle an instrument is called the electrocardiograph, the tracing being designated as the electrogram. See SPHYGMOGRAPH.

PULSOM′ETER. See PUMPS AND PUMPING MACHINERY.

PULSZKY, pu̦l′skḗ, FRANZ AUREL (1814–97). A Hungarian politician and author, born in Eperies. He studied law and visited Germany, Italy, France, Russia, and England, where he wrote in German and Hungarian *Aus dem Tagebuche eines in Grossbritanien reisenden Ungarn* (1837). In 1839 he entered the Diet as member from Sâros. In 1848 he became Undersecretary of State in the Hungarian Ministry of Finance and subsequently Minister of Commerce. After Kossuth went to England Pulszky remained with him and accompanied him on his journey through America, described in *White, Red, and Black* (1852), in English. As he had been condemned to death *in contumaciam* by the Austrian government in 1852, he went to Italy, where he joined Garibaldi in his expedition to Calabria in 1862. In 1866 he was pardoned. After his return to Hungary he was elected to the Diet and became director of the National Museum at Pest. His publications include: *Die Jakobiner in Ungarn* (1851), a romance; *Eletem és Korom* (1882), an autobiography; *Die Kupferzeit in Ungarn* (1884).

PULTE, pu̦l′te, JOSEPH HIPPOLYT (1811–84). An American physician. Born at Meschede, Westphalia, Germany, he emigrated to the United States in 1834 and practiced as a homœopathist in Cherrytown, Pa. In 1844 he removed to Cincinnati, where he lived thenceforth. There, in 1872, he founded with others the Homœopathic Medical College, at which institution he was professor of clinical medicine. He was the author of *Organon der Weltgeschichte* (1844; Eng. ed., 1859); *Homœopathic Domestic Physician* (1850; 50th thousand, 1872); *Woman's Medical Guide* (1853; 4th ed., 1863).

PULTENEY, pŭlt′nḗ, WILLIAM, EARL OF BATH (1684–1764). An English political leader, born in London. He was educated at Westminster School and Christ Church, Oxford, and after traveling on the Continent entered Parliament as a Whig in 1705. On the prosecution of Walpole in 1712 he defended him with great eloquence, and from 1714 to 1717 was his Secretary of State for War. He continued to support Walpole until 1721, when the latter, becoming Premier, failed to include Pulteney in his administration. In 1725, therefore, Pulteney joined the opposition and became the bitter antagonist of his former friend, succeeding by the brilliancy of his speeches in depriving him of his place. Shortly after Walpole's fall in 1742 Pulteney was created Earl of Bath. On the resignation of the Pelham ministry in 1746 he was made Premier, but, unable to form a cabinet, he held the office for only two days and then practically retired from public life. He joined Lord Bolingbroke in establishing the *Craftsman* (1726), a political periodical, and he wrote many political pamphlets and verses, including the popular song *The Honest Jury, or Caleb Triumphant.*

PULTOVA, pu̦l-tō′vȧ. A government and a city of Russia. See POLTAVA.

PUL′TUSK, pu̦l′tu̦sk. A town of Poland, in the Government of Warsaw, situated on the Narev about 34 miles north of Warsaw. It is a well-built town with an ancient castle, the former residence of the bishops of Plotzk. It is noted as the scene of an engagement between the Russians and the French in 1806. Pop., 1910, 18,636.

PULVERIZERS. See GRINDING, CRUSHING, AND PULVERIZING MACHINERY.

PULVI′NUS (Lat., cushion). A term in botany, designating the swollen base of certain petioles which by its differences in turgidity causes the movement of the leaf blade. It is most conspicuous in the pea family, but nowhere so highly specialized or so responsive to stimuli as in the sensitive plant, *Mimosa pudica.* See MIMOSA.

PU′MA (Peruvian name), COUGAR, or MOUNTAIN LION. A large American cat (*Felis concolor*), originally native from the watershed of Hudson Bay to the Straits of Magellan, and still present except in the most civilized parts of the country. It is of slender build, with a rather small head and long limbs, and usually measures about 40 inches from the snout to the root of the tail, which usually is about 26 inches in length and of nearly the same thickness throughout. Unlike the other great American cat, the jaguar (q.v.), which is densely spotted, the adult puma has no spots, except that the lips and the outer rim of the ear are black, there is a patch of white on each side of the muzzle, and the tip of the tail usually is blackish. The upper parts are uniform dull fox red, appearing gray in certain lights, owing to the fact that each hair is fawn gray, red only at the tip; the throat, belly, and inside of the legs are reddish white. This unspotted, tawny coat led the earliest explorers on the Atlantic coast to regard the animal as a lion, and the name survives in the West. The early settlers in the States called it a panther (usually pronounced "painter"). "Cougar" is derived from a Brazilian language, but involves an error. (See COUGAR.) "Puma" was its native name in Peru. Considering that the species is distributed over so great a range of territory, its variations in form and color are surprisingly small.

In the eastern United States it has been greatly dreaded as a fierce and treacherous beast, particularly dangerous because of its alleged habit of springing upon travelers from branches of trees or rocky ledges. In the West, on the other hand, the mountain lion, although more numerous in the Rocky Mountains than the panther ever appears to have been in the East, has always been regarded as a shy and cowardly beast, little to be feared except when cornered. The truth seems to be that this animal has less ferocity than any other of the great cats, and under ordinary circumstances is inclined to avoid rather than to attack men, and often seems to seek their company in a friendly way. This timidity and confidence aided the easy extinction of these animals throughout the eastern part of the country, but they are abundant in the Rocky Mountains and westward, where the ranching industries supply them with abundant food in the young cattle and horses. The principal food of the puma in North America was deer, but it seized any smaller prey which came in its way. In the case of sheep, to which in the southwestern United States it is especially destructive, the puma rarely contents itself with taking a single one, which would satisfy its hunger, but, having once entered a fold or flock, it kills right and left, so that in many cases 100 sheep have been killed out of a flock in one night by a single puma. Their silence when hunting or when attacked is a notable characteristic; yet on rare occasions on winter nights they make the woods resound with terrifying screams. The young are born in the early spring and are usually two or three in number; and it is believed that under natural conditions most pairs breed only once in two years. The kittens at first are covered with black spots and stripes, and their tails are ringed. These markings disappear at the end of about six months, after which they become of the uniform color of their parents. Full size is not attained before the end of the second year, and during all this time they associate with the mother, while the father of the family seems to lead a solitary existence. Like other cats, their hunting is entirely at night.

Bibliography. Alston, in *Biologia Centrali-Americana* (London, 1879–82); F. W. True, "The Puma," an illustrated monograph with full bibliography, in *Annual Report Smithsonian Institution* (Washington, 1889); C. H. Merriam, *Vertebrates of the Adirondacks* (New York, 1893); J. H. Porter, *Wild Beasts* (ib., 1894); Baillie-Grohman, *Fifteen Years . . . in the Hunting Grounds of Western America* (London, 1900); W. H. Hudson, *The Naturalist in La Plata* (4th ed., 1903). See Colored Plate of CAT FAMILY, accompanying article LION; HUNTING BIG GAME.

PUM'ICE (from Lat. *pumex;* probably connected with *spuma,* foam). An effusive igneous rock, having a spongy or frothy texture and composed largely or entirely of glass. It is frequently made up of parallel fibres or threads with intervening spaces to form a delicate structure. It is produced by the expansion of the occluded moisture of lavas when they reach the surface of the earth, and is most abundantly developed in lavas of rhyolitic composition (see RHYOLITE), since these are usually very viscous. It may, however, be exceptionally produced in connection with any effusive rock, and is hence classified in respect to its chemical composition into rhyolite pumice, trachyte pumice, and the like. Most of the commercial product is derived from the Lipari Islands. See ABRASIVES.

PUMP. See PUMPS AND PUMPING MACHINERY.

PUMPEL'LY, RAPHAEL (1837–). An American geologist, born in Owego, N. Y., and educated in Hanover, Germany, and in the mining schools of Paris and Freiburg, from 1854 to 1860. After explorations in Corsica and in Arizona he received in 1861 a commission from the Japanese government to explore the mineral wealth of the island of Yezo. In February, 1863, under pressure of the antiforeign party, the Shogun dismissed the foreign employees who were "spying out the land." Pumpelly then went to China and in behalf of the government made journeys through the central and northern provinces and into the desert of Gobi in order to report upon the coal supply. In 1864 he spent a short time in Nagasaki, Japan, and then returned to Europe by way of Siberia. The Smithsonian Institution published a volume recording his geological researches in China, Mongolia, and Japan, and this was supplemented by a popular narrative of his travels and adventures entitled *Across America and Asia* (1870). After his return to the United States Pumpelly was professor of mining in Harvard University (1866–73). He was the State geologist of Michigan (1869–71) and then of Missouri (1871–73), and in 1879–81 he served with the United States Geological Survey. In 1879–80 he conducted at Newport, R. I., an investigation for the National Board of Health on the filtering ability of various soils. In 1881–84 he organized and directed the northern transcontinental survey. In 1903 he explored the Transcaspian country under the auspices of the Carnegie Institution of Washington. In 1905 he was elected a member of the National Academy of Sciences and in the same year served as president of the Geological Society of America. His publications include: *Geological Researches in China, Mongolia, and Japan,* published by the Smithsonian Institution (1866); *Across America and Asia* (1870); *Iron Ores and Coal Fields in Missouri* (1873); *Geology of the Copper District of Michigan* (1875); "The Mining Industries of the United States," in vol. xv of the *United States Census Report* (1886); *Geology of the Green Mountains* (1894); *Explorations in Central Asia* (1905); *Prehistoric Civilization of Anan* (1908).

PUMP'KIN (variant of *pumpion,* from OF. *pompom,* variant of *pepon,* from Lat. *pepo,* from Gk. *πέπων, pepōn,* kind of melon, ripe; connected with Skt. *pakva,* ripe, from *pac,* to cook; influenced by popular etymology with the Eng. diminutive termination *-kin*). The common name of several annual, vinelike, tendril-bearing herbs of the genus *Cucurbita,* family Cucurbitaceæ, natives of warm countries, cultivated for their fruits. The common field pumpkin (*Cucurbita pepo*) is a coarse running rough-leaved vine, often exceeding 20 feet in length. The fruit is gourdlike, oblong with flattened ends, yellow when ripe, and normally weighing from 15 to 40 pounds. The edible portion consists of a fleshy layer an inch or more thick beneath the rind. In America the pumpkin is extensively planted in cornfields in occasional hills of corn. In its raw state the fruit is used as a cattle food and, after having its hard outer rind and seeds removed, for making pies. The methods of cultivation are the same as for squash (q.v.). See Plate of CUCUMBER ALLIES.

PUMPKIN INSECTS. See SQUASH INSECTS.

PUMPKIN SEED. The common sunfish (q.v.). See Plate of DARTERS AND SUNFISH.

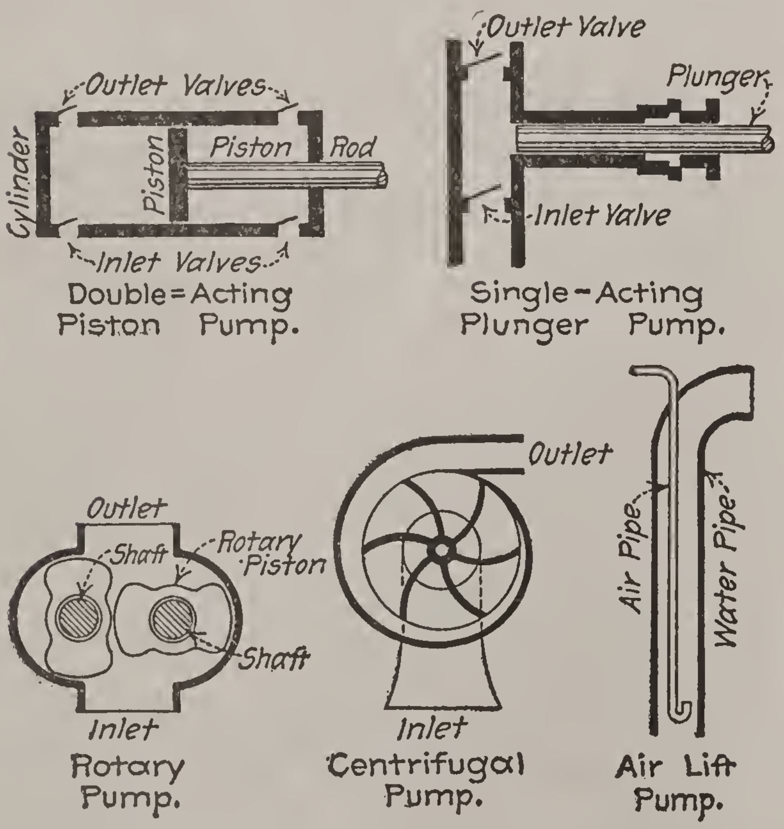
PUMPS AND PUMPING. See MINING.

PUMPS AND PUMPING MACHINERY (OF., Fr. *pompe,* Ger. *Pumpe, Plumpe, Plumpfe*; possibly, though very doubtfully, connected with Lat. *plumbum,* lead). Devices used to move liquids and gases. The various kinds of pumps, without regard to their motive power, may be broadly classified as follows: (1) bucket lifts, or water elevators, by means of which a balanced pole, or sweep, a windlass, or a wheel lowers, raises, and empties one or more buckets or other receptacles; (2) displacement pumps acting on the principle that two bodies cannot occupy the same space at the same time; (3) impellers, which by their own continuous motion in the water to be moved impart some of their velocity to water with which they come in contact; (4) impulse pumps, which employ the force of a suddenly arrested large column of water to lift a smaller column to a greater elevation than the original source (see HYDRAULIC RAM); (5) injectors and ejectors, in which condensed steam traveling at high velocity sweeps along water brought in contact with it.

Most gas and air pumps are displacement and impeller machines, though a few aspirators, working like ejectors, are seen. These notes refer particularly to hydraulic machinery.

Bucket Lifts, or Water Elevators. These are the simplest of the four classes of pumps named. They have been used from the remotest historical times and are still employed in varying forms the world over. The well sweep, or bucket and balanced pole, still frequently seen in certain rural sections of America, is much the same as the shadoof of Egypt and the picotah of India. The single bucket or, in Oriental countries, the earthen pot attached to a rope wound around a windlass is another very common water lift. A series of buckets mounted on an endless rope or chain, dipping into the water below and running over and driven by a wheel above, is an improvement over either of the foregoing, giving a continuous stream of water. Primitive multiple bucket or pot lifts of this general character, driven by animal power acting through a rude combination of wheels and horizontal sweeps, are sometimes known as Persian wheels. Modern refinements of this device are called chain pumps. Norias are ancient wheels (1000 B.C., in China) with buckets attached, each in a plane with the axle but inclined towards the inner end. Sometimes the wheel carrying the buckets is placed in and driven by a running stream. Another form of water lift is the scoop wheel, composed of a series of curved blades, terminating in a hollow axle, into which they discharge the water scooped up by the revolution of the wheel. Where similarly arranged spiral tubes take the place of the blades the device is called a tympanum. Of the various water lifts described the bucket and chain pumps are most extensively used, particularly where manual labor is costly.

Displacement Pumps. Commonly these employ a piston, fitting in a cylinder, forcing the water ahead of it, or a plunger not fitting the cylinder and merely displacing some of the contents. Instead of a piston steam or air may be used to effect the displacement. Valves are essential to prevent back pressure or flow on the return stroke or when idle. In the simplest form valves are pieces of leather or rubber cut to the desired shape and hinged at one edge or side; they lift for the passage of the water upward and close on the reverse stroke. In most large pumps, for strength of design, many small valves are employed instead of one of sufficient size to accommodate the whole flow of water. The majority of such valves consist of an inlet, valve seat, disk, or valve proper, stem, cover plate, and spring, although the spring may be omitted. The disks are commonly made of vulcanized India rubber and the other parts of bronze. Ball and cone valves are also used, particularly on deep well pumps. Valve stems control the lift of the valves and prevent displacement from their seats, while the springs are designed to take up slack. The Reidler valve, used on some of the highest grades of large reciprocating pumps, is closed mechanically instead of by the force of the liquid being pumped, and therefore has a positive and comparatively gentle motion.



PUMPING MACHINERY—TYPES OF PUMPS.

Displacement pumps are subdivided into many classes, of which the following are the most important: *Reciprocating pumps* have either pistons or plungers which move alternately back and forth or up and down, always in a straight line. Such pumps are single or double acting, according to whether the water is displaced on one or both parts of the stroke. Pumps are known as simple, duplex, triplex, etc., according as one, two, or more pistons or plungers are driven by a motive-power unit. They are also known as direct-acting when the motive power is applied in a direct line with the movement of the piston or plunger, and as of the crank-and-flywheel type or of the beam type when either of these devices is employed to transmit the motion. The beam is similar to the walking beam of some steamboats and is an essential feature of the old Cornish beam engine. See STEAM ENGINE.

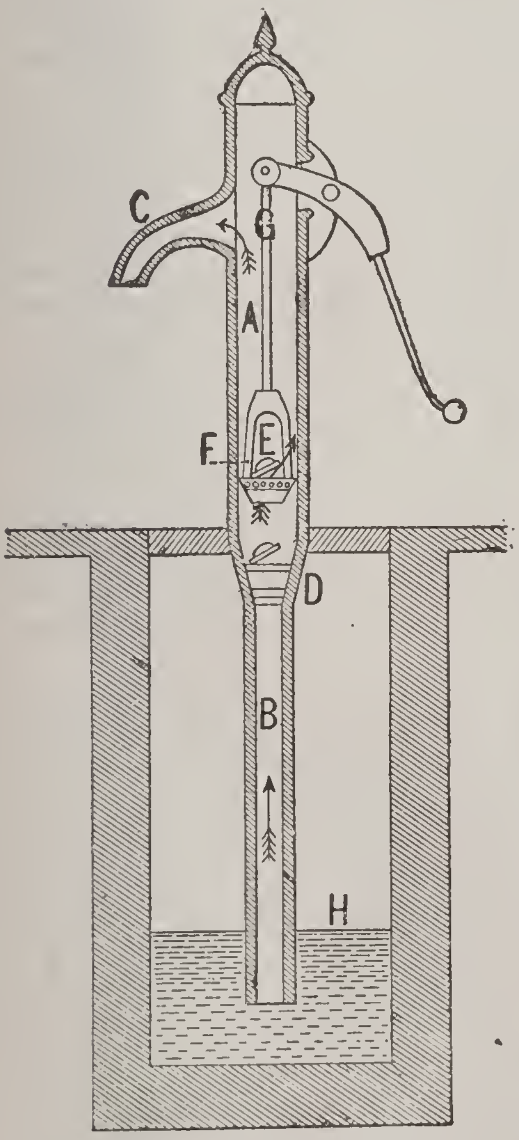
Crank-and-flywheel pumps are quite extensively used, particularly for high duties and for power pumps. Direct-acting pumps are very common. While large numbers of simple pumps are in use, duplex and triple, but more particularly duplex, are the rule, except for small sizes and special purposes. Triplex pumps with a single shaft geared to a motor or turbine are in common use for hydraulic-press work for pressures as high as 5000 pounds per square inch or more. *Rotary pumps* have revolving instead of reciprocating pistons. In a very common form two pistons revolve on parallel axes. Their longitudinal surfaces are formed into a series of curves, so that they mesh closely on the inside as they revolve, while their outer parts fit tightly against a curved pump chamber. *Chain piston pumps* are a simple type, consisting of a series of pistons mounted on an endless chain. Both pistons and chain pass upward through a vertical cylinder, forcing water ahead of them, then descending again to repeat the process.

The pulsometer is a most useful automatic apparatus in which the pump and motive power are combined. The displacement is effected by means of steam acting in two pear-shaped chambers connected at the top to a steam inlet and at the bottom to water inlet and discharge chambers. On admitting steam into one of these the water is forced out gradually until the chamber is empty, when the steam is turned into the other chamber. The first refills with water as the trapped steam condenses, and these actions are repeated in alternate chambers. Such pumps are very largely used by contractors for pumping ditch water, on account of their rugged construction.

The work done by a pump, when the pump is placed above the level of the water to be raised and at the same time below its final elevation, is frequently classified as suction lift for the first part and force lift for raising the water above the pump level. Pumps may perform either suction or force lift alone, or the two combined, according to their location.

As steam lifts more water than any other artificial agent, the term "pumping engine," and even the word "pump" alone, is often employed to denote the combination of a pump and a steam engine in one machine. Electric motors are much used to drive both small and large pumps, and these are commonly designated as electric pumps. When a pump is driven by detached motive power, it is termed a power pump. The term "pumping engine" is usually confined to more or less elaborate machines of large capacity, and the terms "steam pump" and "electric pump" to machines of smaller capacity and simpler design, but there is no hard and fast line between the two. Other motive powers for pumps are gas, gasoline, and oil engines. With the exception of the steam pumping engine the various motors employed to drive pumps will not be described further in this article, and most of the principles involved in the steam end of pumping engine will be explained under STEAM ENGINE.

The accompanying diagram represents the ordinary suction hand pump. A pipe *B* leads up to a cylinder or barrel *A* with the outlet *C*. In the cylinder the valve *D* opens upward. On the piston *F* is a valve *E* opening upward. In working the pump the rod *G* is raised and the valve *E* shuts. The air contained in the lower part of the barrel becomes rarefied and the valve *D* opens. Atmospheric pressure on the water surface *H* causes the liquid to rise in the pipe *B* and air to flow through *D*. When the piston descends it slightly compresses the air in the barrel, which shuts the valve *D* and opens C. As this action continues the air is all forced out and water takes its place. Every successive upward stroke discharges a body of water equal to the displacement of the piston into the pipe above it, and the pump will draw water as long as the action of the piston is continued.



SINGLE SUCTION PUMP.

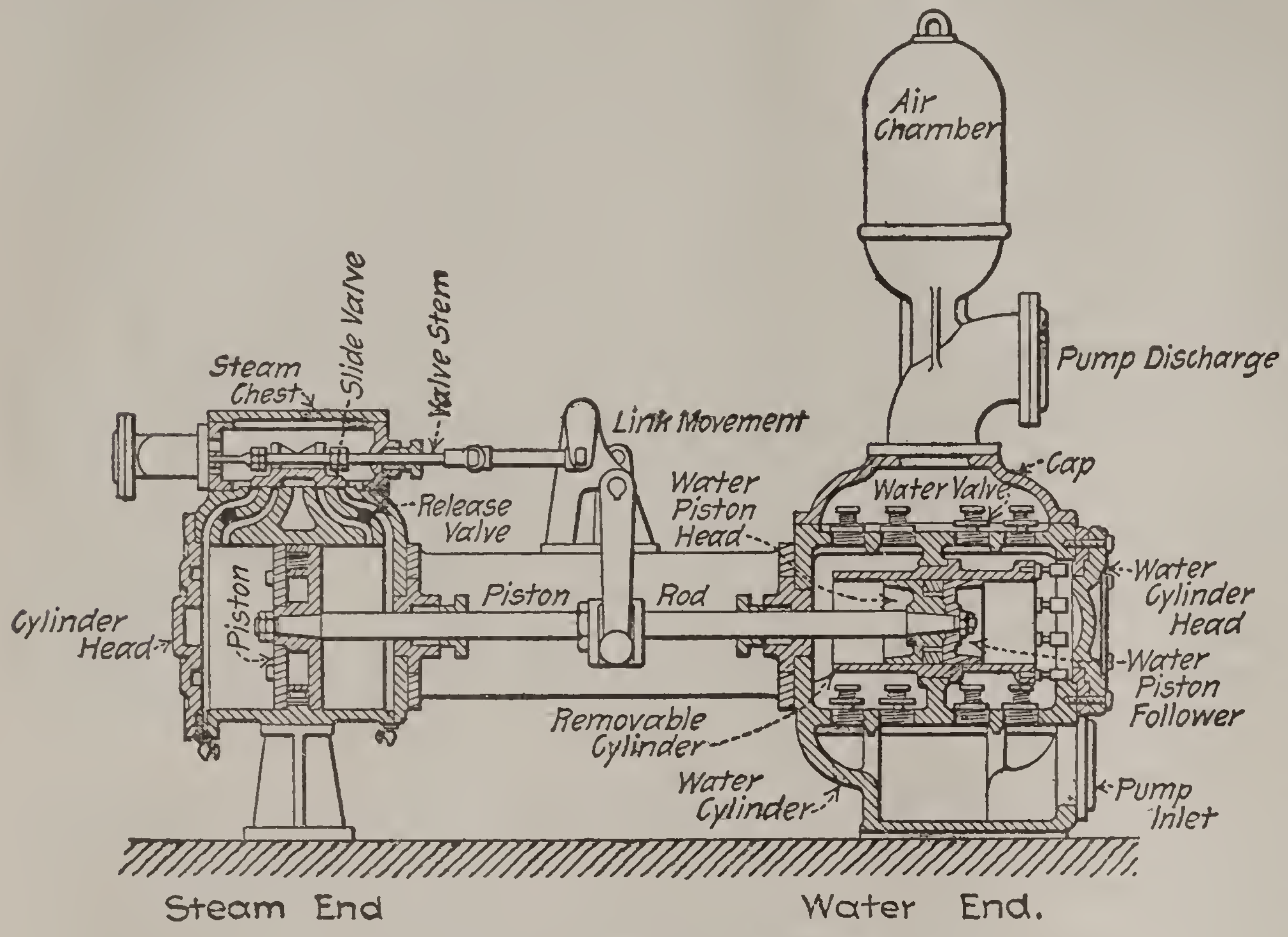
The ordinary forms of lift and force pumps are similar to the suction-lift pump before described, except that the piston is solid and the valve *E* is placed in the discharge pipe, which then leads out from the cylinder below the piston. The water is drawn up into the barrel by suction and then the pressure of the piston in its downward stroke forces it through the outlet valve to any height that may be required.

In these pumps water is discharged in a series of rushes or jerks. It is a great object to procure a continuous discharge, both for its convenience and for the saving of the power wasted by the continual acceleration and retardation of the ascending column. With force pumps this can be done by making the pump double acting, with intake and discharge pipes and valves in the cylinder on both sides of the piston and with the pump rod passing through a water-tight stuffing-box head. An air chamber on the discharge pipe makes the flow still more uniform. The water forced into the pipe during a stroke compresses this air, which, acting as a spring, returns this force to the ascending column when the piston stops to reverse its motion. The pistons or plungers may work in either a horizontal or vertical direction, giving rise to the terms "horizontal" and "vertical" pumps.

Impeller Pumps include the centrifugal, screw (propeller) and jet (injector and aspirator) types. *Centrifugal pumps,* in their simplest form, consist of a series of vanes, or blades, mounted radially on an axis and closely inclosed, except for a chamber around the impeller circumference, in a casing. The centrifugal action of the revolving blades throws the water outward into the discharge passage. When guide vanes are placed in the casing passage around the impeller to guide the water, decrease its velocity, and increase the pressure, one has the turbine pump. The pressure developed by a single rotor depends on the speed, and practical design requires a pump with several impellers on one shaft for heads above about 150 feet, the discharge of one impeller going to the intake of the next.

Aspirators and *injectors* make use of a jet of steam or water, which, being delivered at high velocity through a small throat, imparts some of its velocity to the water to be moved. The air lift has been classed by some as a displacement and by others as a jet pump. It seems more correct to say that its action depends upon the formation of a column of mixed water and air, which, because of its lesser specific gravity or weight, is overbalanced, or raised, by a column of water. Two tubes are employed, the smaller of which is centred within the larger. The small inner type conveys compressed air down into the volume of water to be lifted. The air and water together rise up through the outer and larger tube. This device is used oftentimes as a substitute for deep-well reciprocating piston pumps, which require the placing of moving parts deep in the well and connecting by long rods with motive power at the surface. Air-lift pumps are cheap in first construction, simple in operation, and have no wearing parts, but their fuel economy is low.

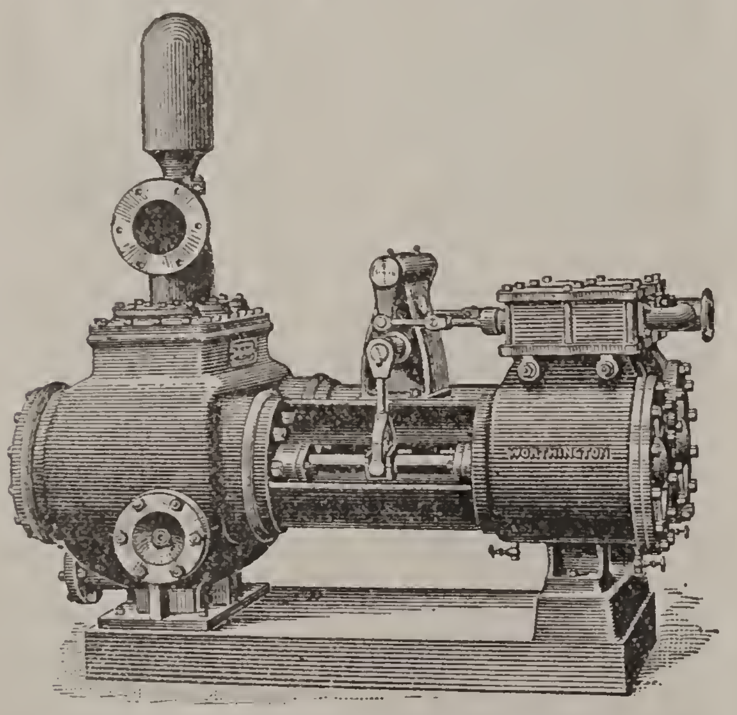
Steam Pumping Engines. The simplest of these machines consists of a single steam and a single water cylinder, with a common piston, but this type did not come into use until ponderous beam engines had been employed for scores of years. Most steam pumping engines have pumps of the displacement type. The steam end of the pump may use the steam at its initial pressure through the whole length of the stroke, when it falls in the simple, high-pressure type. If now the steam, after having done all possible work in the first cylinder, is admitted to a second one, still further service may be secured and the machine becomes compound. A third or even a fourth cylinder may be used, in which case the terms "triple expansion" and "quadruple expansion" are employed.



SECTION THROUGH SMITH-VAILE STEAM PUMP.

Great refinements of design are seen—steam jackets on cylinders, reheating receivers between cylinders, regenerators heating boiler feed water almost to steam temperature, highest safe steam pressures, etc.

If it is desirable to obtain still higher degrees of expansion, cut-offs are employed, so that the steam is shut off when the stroke of the piston is but partially completed. The balance of the stroke is due to the expansion of the steam in the cylinder and is a gradually decreasing pressure. (See Steam Engine.) In the direct-acting pumps the piston speed is maintained through the whole stroke by means of a compensating device. One of the best known of these, the Worthington high-duty attachment, employs an accumulator for this purpose, consisting of a pair of oscillating cylinders connected to an air tank or the water main. The pistons are connected obliquely to the pump piston, so that during the first part of the pump stroke they oppose the steam cylinder and during the last part of the stroke assist it. This allows the steam to be cut off during the last part of the stroke so that it can work expansively and more economically. In place of this device another manufacturer employs a portion of the pressure of one side of a duplex engine to aid the expanding steam on the other side, the two pump pistons being cross connected with links and rods. Where a flywheel is employed it affords all necessary compensation, exactly as in the steam engine. The Holly-Gaskill is the best-known type of a horizontal flywheel pumping engine, and the Leavitt and Allis engines illustrate the vertical type. The object of these various devices is to secure greater economy in the use of fuel, to which end an increased first cost of construction, or capital outlay, is undergone. Such engines are classed as high duty.

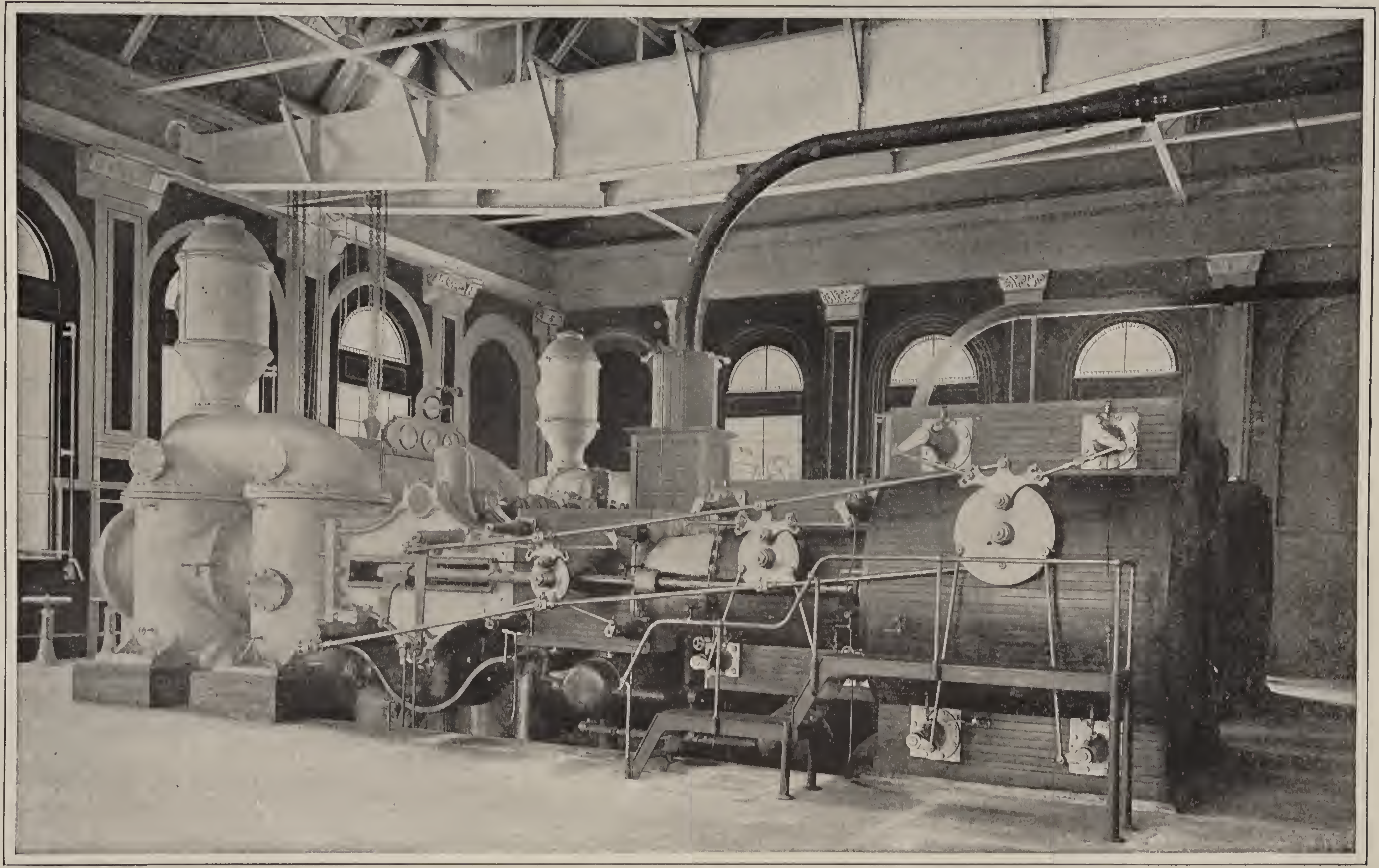


WORTHINGTON PLUNGER AND RING PATTERN PUMP.

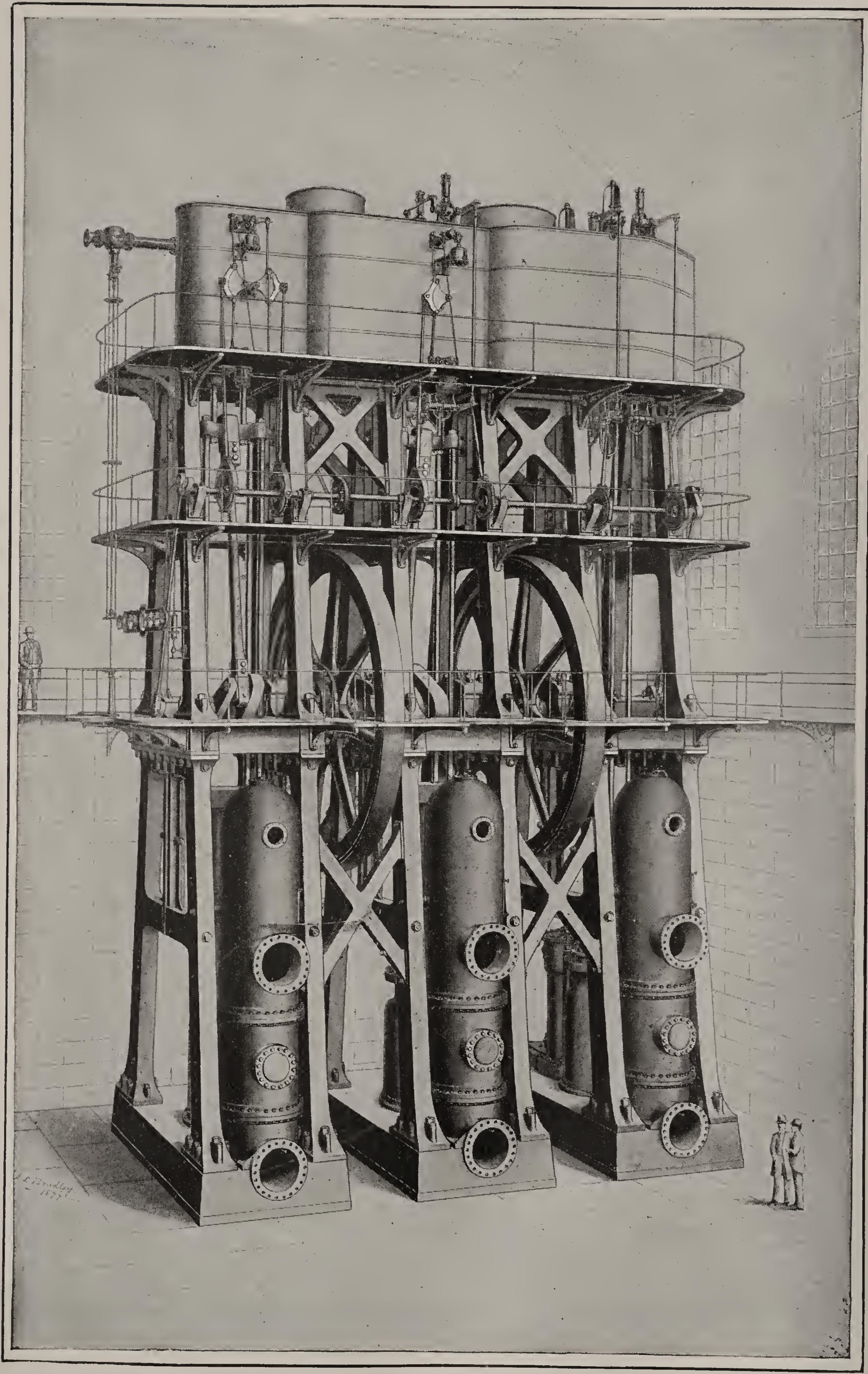
The phenomenal success of the steam turbine and centrifugal pump has resulted in simple pumping units having only rotary motion and approaching the economy of the more complicated high-duty engines. They can be had in any capacities for any heads, and their lower efficiency is often more than offset by their lower price, diminished upkeep, and smaller space requirements.

Gas Explosion Pumps. A radically new machine is the direct-acting water-piston internal-combustion pump. An under-water cylinder is surmounted by an explosion chamber, with gas and air inlet and exhaust valves and rests on an elbow foot piece that connects to a delivery pipe and elevated tank. Charges of fuel gas and air are exploded (much as in a gas engine) above the water and cause surges of the water column. This movement exhausts the spent gases, draws in fresh charges of fuel, discharges water from the top of the play pipe, and takes in more water. A duty of 200,000,000 foot pounds per 1,000,000 British Thermal Units has been secured. The commercial development of this type is due to H. A. Humphrey of London, though the pioneer American invention was made by W. H. Smyth of Berkeley, Cal.

The duty of a pumping engine was formerly expressed in millions of pounds of water lifted 1 foot high by the consumption of 100 pounds

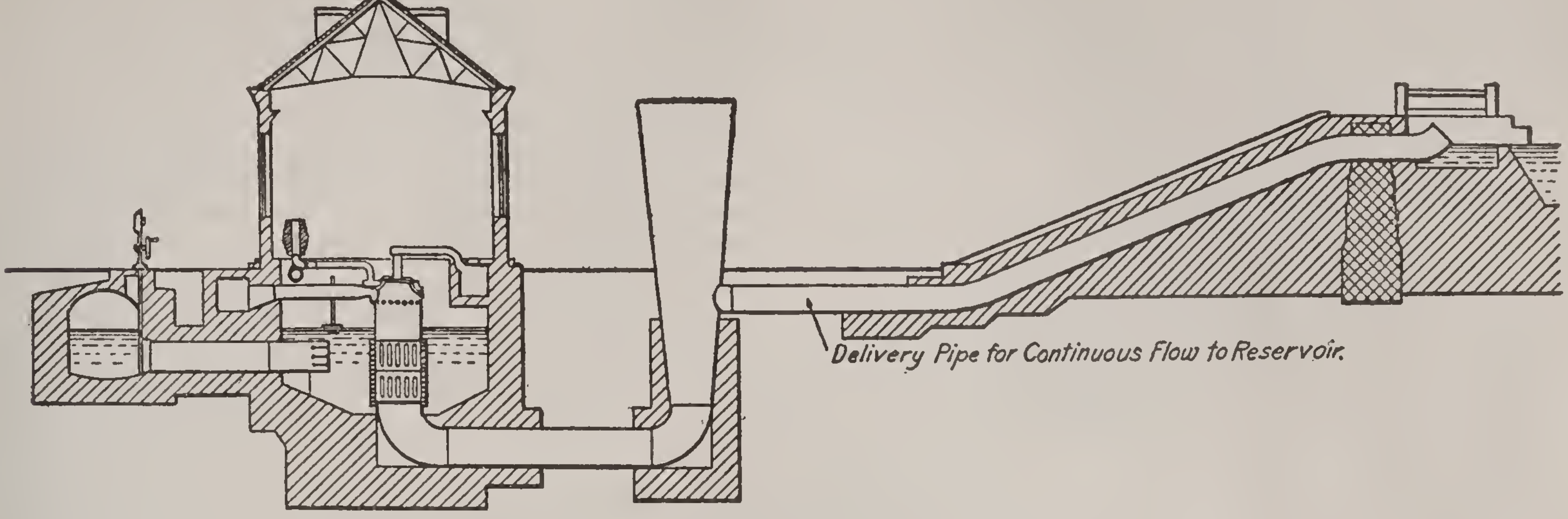


HIGH-DUTY WORTHINGTON TRIPLE-EXPANSION PUMPING ENGINES
Baltimore Water-Works High-Service Pumping Station
(Daily **Capacity of each** engine, 17,500,000 gallons)



ALLIS VERTICAL TRIPLE-EXPANSION PUMPING ENGINE
ST. LOUIS WATER WORKS

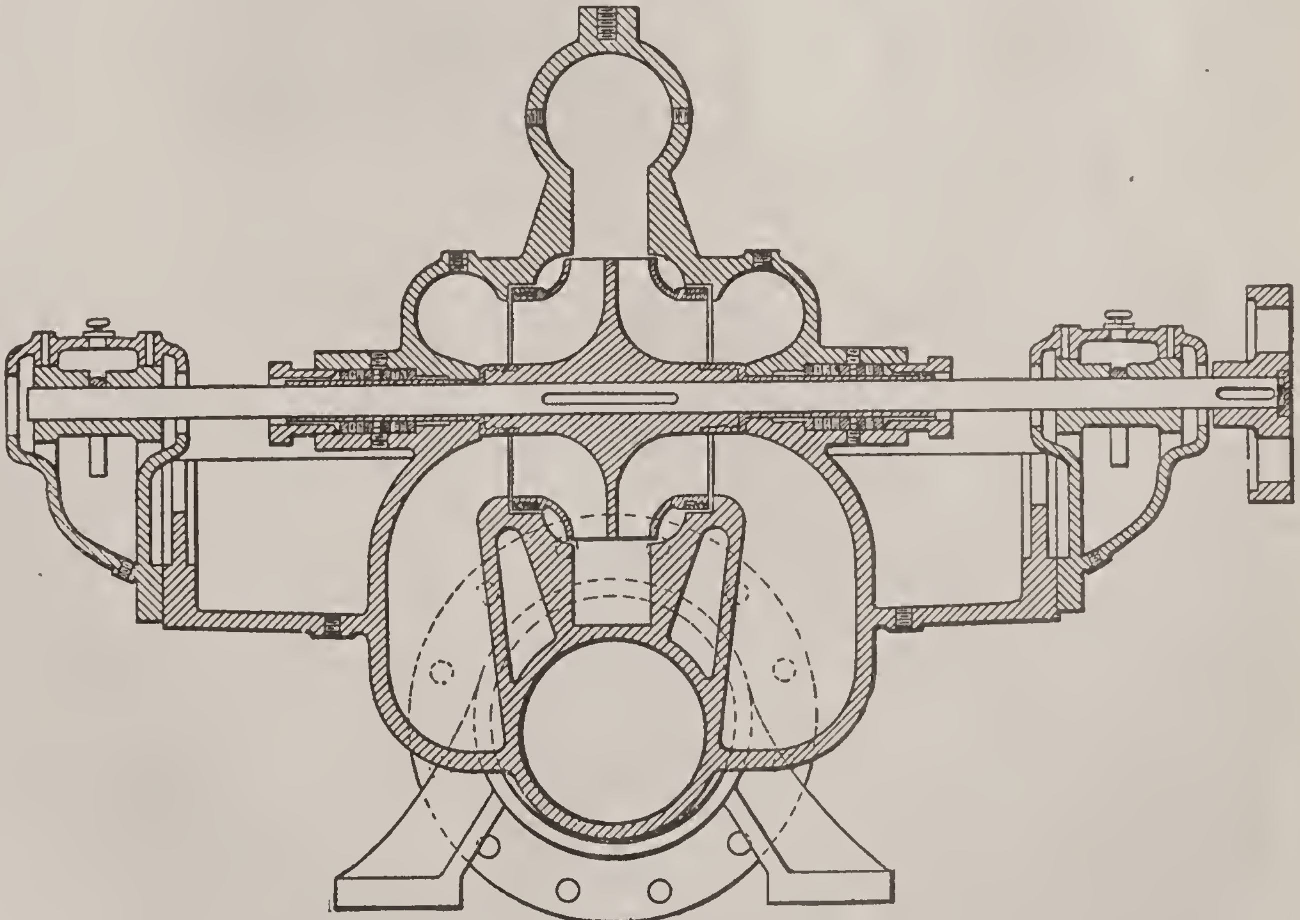
of coal. Since coal is variable in quality there was substituted for it as a basis the work done by 1000 pounds of dry steam; the use of superheated steam made the heat content of 1000 pounds of steam a variable, so that a further refinement, foot pounds of work per 1,000,000 B. T. U., has been substituted. The duty of pumping engines has increased, in round numbers, from 6,000,000 foot pounds per 100 pounds of coal (coal basis) for the Newcomen atmospheric pumping engine of 1769 to 180,000,000 foot pounds (heat-unit basis) for the best crank-and-flywheel triple-expansion pump of the present day. The wide range of efficiency of various types of pumps now used is shown by the following figures from Turneaure and Russell's *Water Supply* (New York, 1908), based on the duty per 1000 pounds of steam: high duty, 168–100 million; ordinary pumping engines, 100–75 million; steam pumps, 40–10 million; direct-acting deep-well pumps, 6–2 million; vacuum pumps, 8–2 million; jet pumps, 4–1 million foot pounds. Power pumps, with direct-connecting engines, the pumps alone having an efficiency of 75 per cent, are ranked at 114 to 37 million according to the type of engines. The air-lift pumps, with a pump efficiency of 25 per cent, are figured to give duties of 31,000,000 to 6,000,000 foot pounds per 1000 pounds of steam, with various styles of air compressors. The thermal efficiencies of the above three classes of pumping apparatus (i.e., pump and motive power combined) range from 20.6 per cent for the high-duty engines to 0.13 per cent for the jet pumps, 14.7 per cent for the triple-expansion condensing engines and power pumps, 4.8 per cent for simple high-speed condensing engines and power pumps, and 4 to 0.77 per cent for air-lift pumps. Since this list was compiled progress in design and construction has brought the records of high-duty machines up to 180 million and centrifugal power pumps to 165 million.



SECTION THROUGH HUMPHREY PUMPING UNIT AT CHINGFORD, ENGLAND.

Station has four 47,500,000-gallon and one 26,000,000-gallon units; head, 25 to 30 feet. Tests have shown a fuel consumption of 0.93 pound coal in the gas producers for water horse-power hour of the pumps.

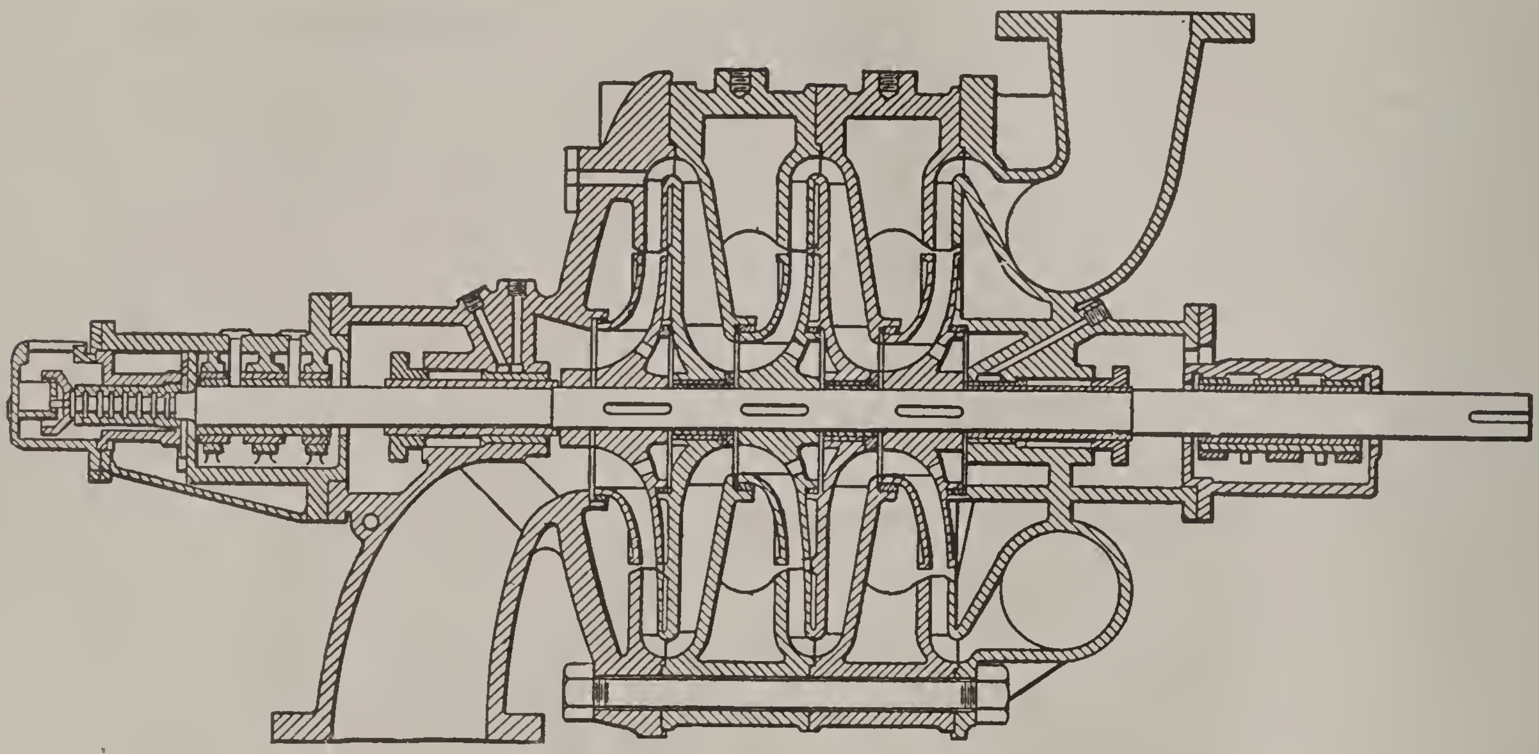
Historical Sketch. The earliest authentic record of a displacement pump seems to be a description of the force pump of Ctesibius of Alexandria, in Hero's *Spiritalia.* Two single-acting vertical pumps were operated alternately by a common beam, or brake, and the two discharge pipes were connected with an air chamber and the stream was then thrown from a movable nozzle. In the fifteenth century there is evidence of the frequent use of hand pumps in wells, and, in fact, it seems that they may have been well known over 1000 years earlier, for a German translation of *Vegetius* (Erfurt, 1511) contains an illustration of a suction-lift pump with a rectangular barrel. The original of this work was dedicated to Valentinian II (375–392 A.D.). The substitution of a plunger for a piston in the ordinary force pump is credited to Sir Samuel Moreland, who obtained an English patent on the device in 1675. A



SECTION THROUGH SINGLE-STAGE DOUBLE-SUCTION CENTRIFUGAL PUMP.

double-acting force pump was described by La Hire in 1716, in the *Memoirs of the French Academy.* The rotary piston pump dates from the sixteenth century or earlier. Servière (born at Lyons in 1593) describes a number of rotary pumps, including a double interlocking piston pump. Various modified designs have been brought out and the type still survives, but it is seen only in small sizes and is comparatively unimportant. See FIRE ENGINE.

A crude form of water-pressure pump was described by Fludd in 1618. A column of water was raised by means of a vertical piston driven by the weight or pressure of a second and higher column. About 1739 Belidor introduced in some French mines what might be termed a single direct-acting horizontal water-pressure engine much like the simplest form of steam pump of the present day. When the pressure water, which in this case was also the water being pumped, had forced the corresponding piston to the end of the stroke, the water was automatically diverted beneath both pistons to the air chamber with which the pump was provided and also to the other end of the pump. This reversed the stroke of both pistons, whereupon the operation was repeated.



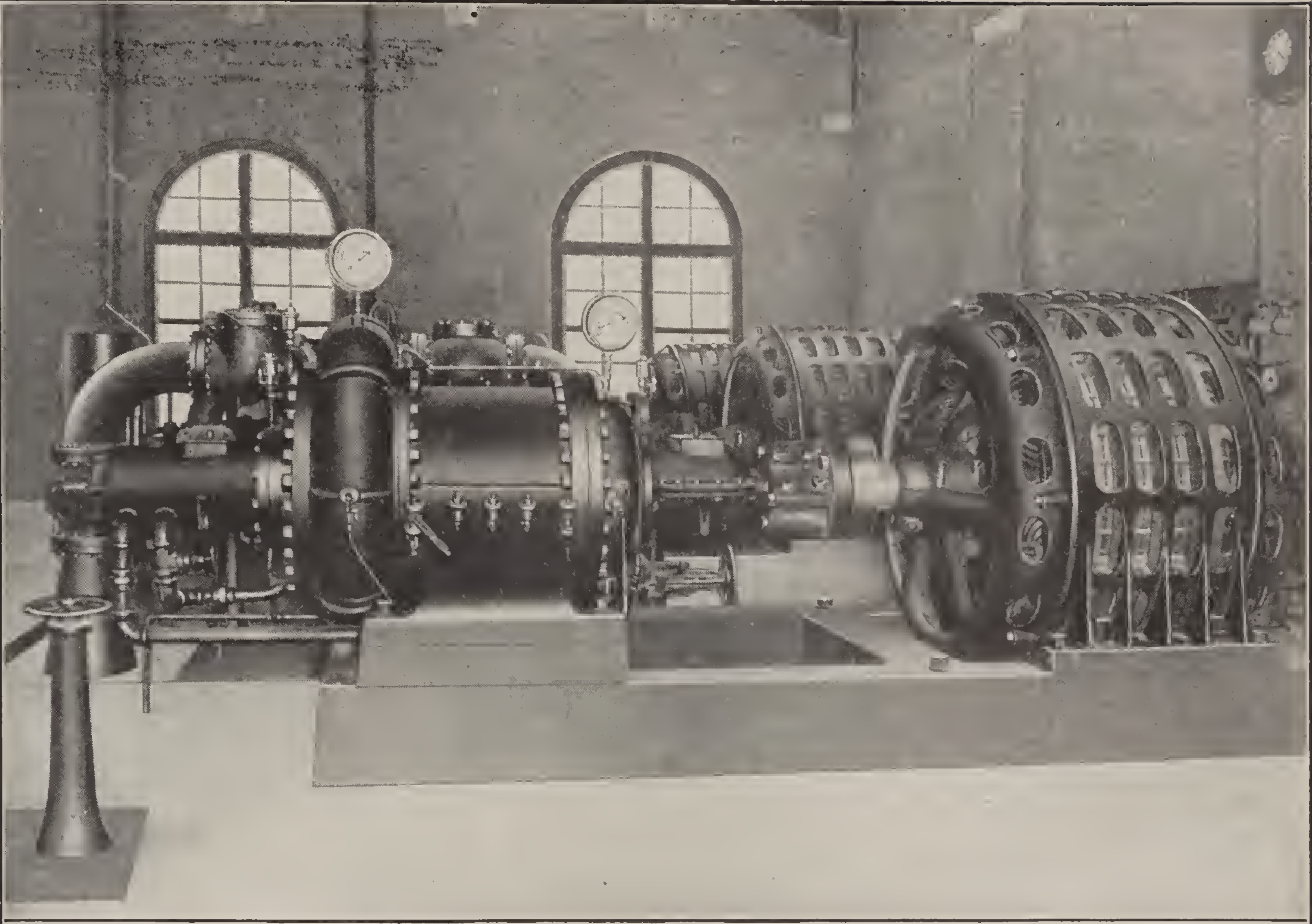
SECTION THROUGH WORTHINGTON THREE-STAGE TURBINE PUMP.

The invention of the centrifugal pump is ascribed to Lemour, who, in 1732, sent to the French Academy a description of a very elementary hand pump of this type. One of the earliest centrifugal pumps to come into practical use was the Massachusetts pump of 1818. It was like a fan blower, with four right-angled blades. Conspicuous among the later ones were the Gwynn, Andrews, and Appold. The last was exhibited in England in 1851. It was a great improvement over all others up to that date and has been the basis of successful designs made since. The impeller was a conical chamber (its axis coincident with the shaft centre line) with curved vanes. Later, to balance end thrust, water was brought into both sides of the impeller; where that is not done a special bearing is used to support the unbalanced force.

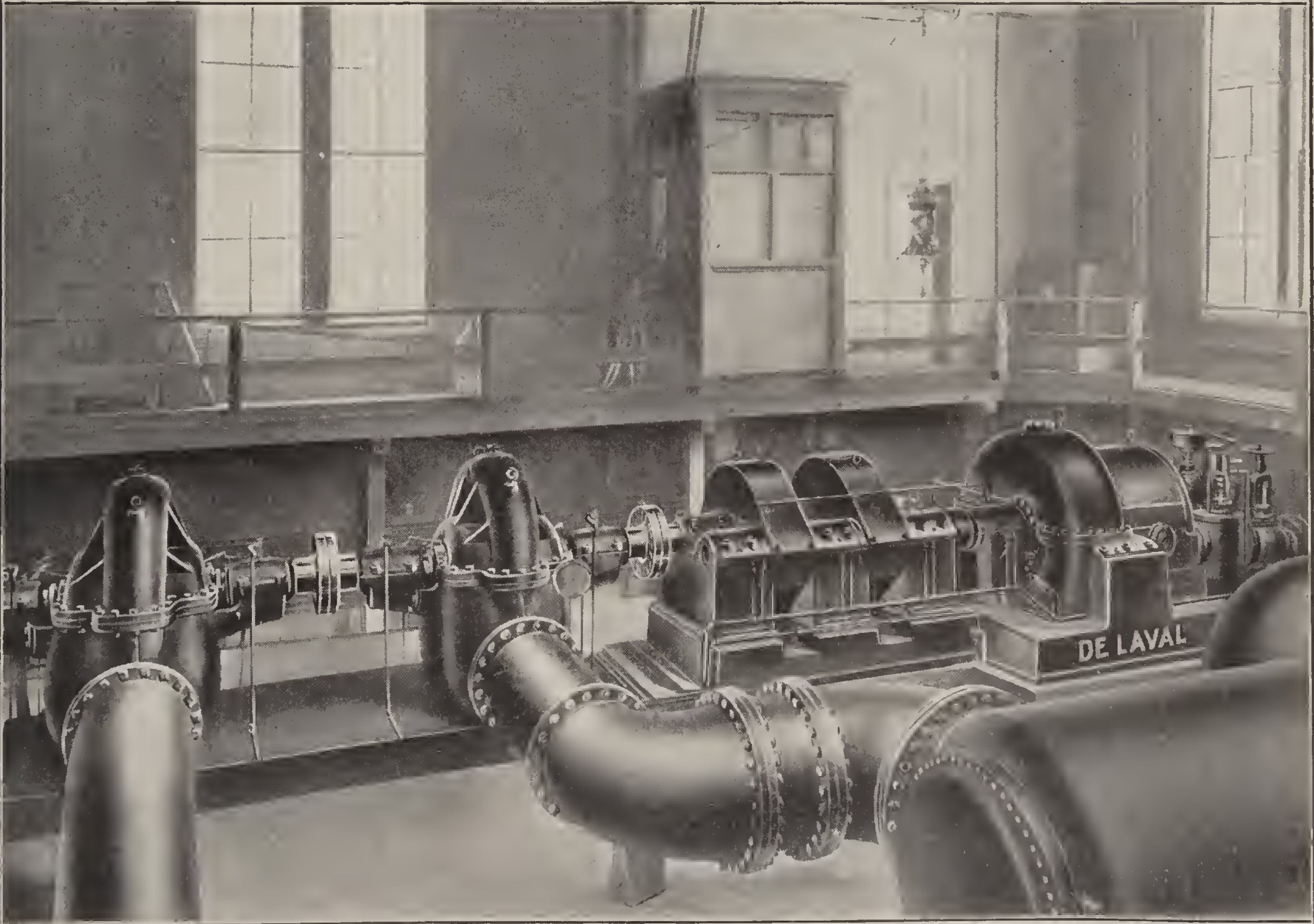
A screw-wheel pump of immense size and capacity, but of very low lift, was put in operation at Milwaukee, Wis., in 1889. It is used to force water through a brick-lined tunnel, 12 feet in diameter and 2500 feet long, to flush the Milwaukee River, which is badly polluted with sewage. The screw wheel is 13 feet in diameter. At 60 revolutions per minute it delivers 525,000,000 gallons a day against a head or lift of 4 feet. On a run of a number of months it gave a duty of 69,000,000 foot pounds per 100 pounds of coal. Screw-propeller pumps have found only a part of their possible service. One of the latest designs is that in which a 12-foot impeller revolves in an inverted siphon elbow. One guide and a thrust bearing are inclosed in the flow pipe, but the shaft is brought out at the other end through a stuffing box for connection to the driving motor. Each has a capacity of 322,000,000 gallons per day against 5 or 10 foot head. A 600 or 1200 horse-power motor is used, and the pump efficiency is about 70 per cent. These are used for the drainage of the city of New Orleans and were designed by A. B. Wood.

The use of compressed air to raise water, the air itself also being compressed by a column of falling water, is described by Hero in his *Spiritalia;* this, while showing a knowledge of the principle, was merely a toy. At a mine in Schemnitz, Hungary, in 1755, water was lifted from 104 feet beneath the surface by water from a spring 140 feet above the mouth of the shaft. The spring water compressed air in a strong copper cylinder at the mouth of the shaft, which, being piped to a second cylinder at the base of the shaft, forced the water up and out through another pipe. The valves were operated by hand.

A number of patents for raising liquids by ejectors were granted in the United States between 1860 and 1870. At present where compressed air is used to raise water the compression is effected by air compressors (q.v.). The air is applied in one of three ways: (1) simple displacement; (2) as a substitute for steam in pumping engines; (3) in the air-lift pump. In all these three cases air is thus used because of its greater mechanical convenience under special conditions or because of the readiness with which it may be conveyed through pipes at remote and inaccessible points. One of the principal examples of air-displacement apparatus now in use is the Shone ejector, brought before the public in 1878. Although available for other purposes, it is chiefly used to lift sewage from relatively small isolated



MULTI-STAGE CENTRIFUGAL PUMPS FOR HIGH PRESSURE FIRE SERVICE, BOROUGH OF MANHATTAN, NEW YORK CITY. Capacity of each unit 3000 gallons per minute at 300 lbs. pressure. Driven by 880 H.P., 6600 volt, 3-phase, 25-cycle, Induction Motor. Made by Allis-Chalmers Co., Milwaukee, Wisconsin



CENTRIFUGAL PUMPING UNIT, KIRTLAND STATION, CLEVELAND, OHIO Capacity 30,000,000 gallons per day; head 260 feet; duty 128,400,000 ft. lbs per million B. t. u.; two 24-inch-600 revolutions per minute pumps driven through double helical gears by 1300 H.P steam turbines. Made by the De Laval Steam Turbine Co.

districts. The sewage is received in an air-tight chamber provided with valves on both the inlet and outlet pipes. Compressed air from a central station is let in to displace the sewage in the chamber. The falling sewage, when the chamber is empty, automatically shuts off the air supply. The Liernur system of removing house wastes, developed about the same time as the Shone, makes use of a vacuum instead of compressed air. By this means the wastes are from time to time sucked into central chambers, and from there to a single central station, where the air-exhausting pumps are located. See SEWERAGE.

The air-lift pump was suggested by Freiburg in a pamphlet published in 1797, described in an English translation (1876) of lectures on mining by Callon, patented by Joseph P. Frizzell, of Boston, in 1880, and used in Berlin, Germany, about 1885. About the latter date Prof. Elmo G. Harris, of Rolla, Mo., developed an air lift. But the introduction of the device to practical use was largely due to Julius G. Pohle, who made various applications of air to raising water, beginning in 1886. Since then the Pohle and various other air-lift pumps have been adopted for raising water from deep wells at many municipal and private water-supply plants. Different designers have used various foot pieces for the introduction of the air to secure small bubbles in some cases and large air bodies in others. Recent investigations, however, show that the results are nearly alike in all cases and that the foot-piece details are relatively unimportant. Very small bubbles coalesce to form larger ones, and very large air bodies are broken up into smaller ones. The greatest improvement since Pohle's work has been the booster of F. S. Miller, of Indianapolis. This is a simple vented separation chamber into which the water-air mixture is discharged. The water can be carried from this by the residual air pressure for distances of several hundred feet and elevated without repumping.

The development of the steam pumping engine was foreshadowed by the steam fountain of Hero, the improved steam fountain of the Italian Porta, described by him in 1601, in which a separate boiler was used, and the inventions of the Marquis of Worcester, who is supposed to have been the first to put this device in practical operation for raising water intermittently. In 1663 Worcester secured patents on an improvement of this device. A separate boiler supplied steam alternately to two vessels placed over the water to be lifted and connected thereto by means of pipes. The condensation of steam in the vessel created a vacuum, whereupon atmospheric pressure filled this chamber with water from below. Meanwhile steam displaced the water in the other vessel. This was a forerunner of the pulsometer pump, described above.

Next in order of importance among those to whom we are indebted for the pumping engine comes Thomas Savery, who in 1698 patented the first pumping engine used to drain the mines of Cornwall. The water-raising features of this machine were essentially the same as those of Worcester, but Savery added a surface condenser and a second or feed-water boiler. In 1705 Thomas Newcomen, John Calley, and Savery patented a pumping machine which combined a steam piston, outside condenser, balanced beam, pump rods, and a bucket piston pump. On applying the condensing jet a vacuum was created beneath the piston, whereupon atmospheric pressure forced the piston down, and with its fall the steam end of the beam also fell, while the water end, with the pump rods and pump, was lifted. When steam was admitted beneath the piston the atmospheric pressure was balanced and the pump rods fell. Smeaton made great improvements in the Newcomen engine, but it was James Watt who, during the second half of the eighteenth century, transformed the atmospheric into the steam engine. (See STEAM ENGINE.) Watt left the pump end of the device much as he found it. Towards the close of the eighteenth century the use of the steam engine had been confined almost wholly to the raising of water, and the most notable steam pumping engines thus far developed had been erected in the mines of Cornwall. From 1800 to 1840 various improvements in these machines were made and the term "Cornish engine" came into use. The pump end changed from the bucket piston lift to the plunger force pump, but the ponderous beam still remained.

In 1840 Henry R. Worthington, of New York, while experimenting on the application of steam to canal navigation, invented the direct-acting steam pump to feed his boilers. In 1845 the manufacture of such pumps was begun in South Brooklyn, and in 1850 Mr. Worthington submitted a number of small low-lift valves for the single high-lift valve previously employed. In 1855 the first direct-acting Worthington pump for water-works service was put in use at Savannah, Ga. It was not till 1863 that the first duplex Worthington pump was erected. This was at Charlestown, Mass., and it had a capacity of 5,000,000 gallons a day. In 1884 the Worthington high-duty pump attachment, already described, was perfected by C. C. Worthington. The original device was invented by J. D. Davis in 1879 and subsequently bought by the Worthington firm. The Worthington pumps are of the horizontal type.

A high-duty pumping engine, designed by I. P. Morris of Philadelphia, was installed at Lowell, Mass., in 1873. It was a vertical compound, having the two steam cylinders under one end of the beam and the pump and flywheel under the other end. It had a daily capacity of 5,000,000 gallons and gave a duty of 93,000,000 foot pounds per 100 pounds of coal. In the same year (1873) another type of high-duty pumping engine, after designs by E. D. Leavitt, Jr., of Cambridgeport, Mass., was tested at Lynn, Mass. It showed a duty of 104,000,000 foot pounds per 100 pounds of coal. This was the first of a series of high-duty flywheel engines designed by Leavitt, which changed, later on, from the compound to the triple expansion type. One of these pumping engines, built for the Calumet and Hecla Mining Company, in Michigan, has a daily capacity of 60,000,000 gallons. For a high-lift and high-duty pump this is believed to be unsurpassed in size.

Another name connected with the development of pumping engines is that of George H. Corliss, of Providence, R. I. He erected a compound engine with double-acting pump plungers at Pawtucket, R. I., in 1878, which gave a duty of 127,000,000 foot pounds per 100 pounds of coal. The pump end had annular bronze valve disks only $\frac{1}{32}$ inch thick. The diameters of the valves were 2¼ inches and the lift 1 inch. The aggregate area of the valves was equal to the area of the plungers. A type of flywheel pumping engine which has been very widely used in the United States is the Holly-Gaskill, invented by H. F. Gaskill, of Lockport, N. Y. The first of these was erected at Saratoga Springs, N. Y., in 1882. It had a capacity of 4,000,000 gallons a day and showed test duties ranging from 102,000,000 to 113,000,000 foot pounds per 100 pounds of coal. It was a compound, horizontal, crank-and-flywheel engine with double-acting plunger pumps.

Another class of high-duty pumping engines is commonly known as the Allis, from the makers, and is frequently named from the chief engineer of the builders, Edwin Reynolds. The first pump of this type was built in 1886 for the city of Milwaukee, Wis. The three pumps are single-acting plunger, the engines are triple-expansion, and the cranks are placed on the axle at the angle of 120° with each other, in order so to vary the time of the stroke of each pump as to give a continuous flow of water. This pumping engine gave a test of 129,000,000 foot pounds per 100 pounds of coal, greatly exceeded by later Allis machines.

A series of pumping engines notable for refinements of design and efficiency have been designed by B. Nordberg of Milwaukee. Prominent features of his type are the system of steam jackets to prevent cylinder condensation and the recovery of exhaust heat for boiler feed water.

Old Municipal Pumping Plants. In 1582 a Dutchman named Peter Maurice erected a large pumping plant at London Bridge for the water supply of London. A current wheel drove 16 force pumps, each 17 inches in diameter and 30 inches long. By this means 216 gallons of water per minute, or 311,000 gallons a day, were raised to a cistern at an elevation of 120 feet, from which buildings near by were supplied through lead pipes.

The earliest pumping plant in America, or at least the earliest one on record as supplying water for municipal purposes, was built at Bethlehem, Pa., some time between 1754 and 1761. It is described as a 5-inch lignum-vitæ pump, and lifted water to a height of 70 feet through bored hemlock logs. In 1761 three single-acting iron force pumps of 4-inch bore and 18-inch stroke, driven by an undershot water wheel, were substituted. Of other early American pumping plants, the Centre Square and the Fairmount works at Philadelphia, started in 1801 and 1815 respectively, are perhaps the most notable. It is stated that about 1760 a Newcomen atmospheric pumping engine was imported from England for use at copper mines near Belleville, N. J. What appears to have been the first steam pumping engine to be built in the United States was erected by the city of Philadelphia in 1800 and put in operation on Jan. 27, 1801, at the Centre Square Works. One of the pumps lifted water from the river level to a second pump about 50 feet higher, which in turn raised it another 50 feet. Both pumps were double-acting force pumps and the engines had wooden lever beams and flywheels. The pumps had a daily capacity of 3,000,000 gallons. The iron steam cylinder of at least one of these engines was cut in halves, united by copper, and secured externally by an iron band 18 inches wide. This cylinder was 36 inches in diameter.

See Air Compressor; Archimedes' Screw; Drainage; Hydraulic Ram; Steam Engine.

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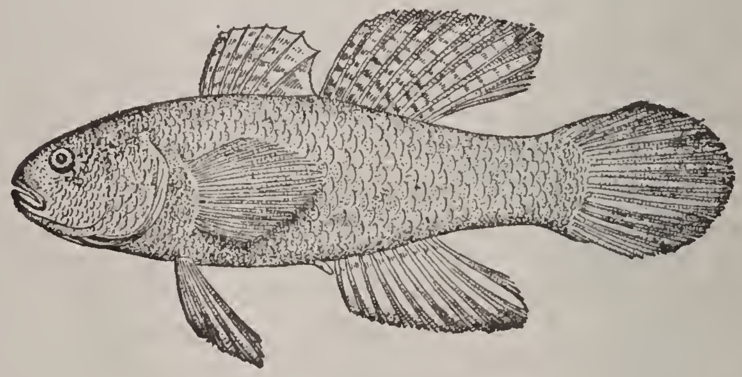
PUNA. See Poona.

PUÑACA, po͞o-nyä′kȧ. A small goby or guavina (*Dormitator maculatus*), dark brown, with lighter bluish spots, and from 1 to 2 feet in length. It presents a great variety of forms. This and a number of closely allied fishes (see Guavina) are called sleepers because of their burying themselves in the mud in order to pass unfavorable seasons in dormancy.



THE PUÑACA.

PUNCH (abbrev. of *Punchinello,* from Fr. *Polichinelle,* from It. *pulcinello,* clown, buffoon, puppet, probably a dim. of *pulcino,* child, young chicken, from *pullus,* young chicken, young of any animal). The chief personage in the popular comic drama of *Punch and Judy,* performed by means of small, hollow, flexible puppets, animated by the thumb and two fingers of the exhibitor. The latter, who holds Punch and Judy above his head, himself remains concealed in a long, upright, portable box or by curtained poles. The miniature stage, as it were, is thus raised to a level easily seen by a seated audience. The small figures of Punch and Judy should be distinguished from marionettes. See Puppet.

The history of the play in which Punch figures is hardly less obscure than that of its designation. The invention of the piece is ascribed to an Italian comedian, Silvio Fiorello, about 1600, but it was later modified by Andrea Calcese, and very likely it is in substance much older. The personality of Punch has even been traced back to the simpleton Maccus of the ancient Atellan farces, though with little other proof than its resemblance to a small bronze figure of the latter, discovered near Naples in 1727. The form of the play as we know it seems to be largely of French development, since our Punch is in several respects quite different from the character as he has survived in the vicinity of Naples. Having found its way to England in the seventeenth century or perhaps earlier, the exhibition became very popular there. Its popularity seems to have reached its height in the time of Queen Anne, and Addison has given in the *Spectator* a criticism of one of the performances. The scenes, as now given by strolling *Punch and Judy* shows, are much shortened from those originally performed, in which allusions to public events of the time were sometimes interpolated. The minor variations of the acted version are infinite. A similar character is said to exist in the puppet shows of India and elsewhere in the Orient. In Paris Punch, who is a great favorite of the children on afternoons in the Champs Elysées, is called Guignol (q.v.). This name properly belongs to a puppet character of Lyons, invented about the end of the eighteenth century, quite local and figuring in several mimic comedies. When brought to Paris the title was applied to the original Polichinelle. Punch generally appears as a hook-nosed, humpbacked figure, knavish, boastful, and cowardly, and given to the reckless use of a club which is often in play upon the backs of his wife Judy and others of the *dramatis personæ.* Consult works cited under PUPPET; also Payne Collier, ed., *Punch's Real History* (1st ed., London, 1828; 3d ed., ib., 1844), illustrated by Cruikshank.

PUNCH. A humorous and satirical illustrated weekly, the best of its kind in England. It is doubtful if the whole story of its origin will ever be known, but the consensus of opinion seems to be in favor of crediting the original idea to Ebenezer Landells, a London wood engraver and draftsman, and Henry Mayhew, a well-known wit and writer. The original idea was to reproduce in London the success of Philipon's *Charivari*, which already had an established position in Paris. Mayhew secured Mark Lemon as editor and a staff of writers, and the first issue was published on July 17, 1841. According to Lemon's manifesto, published in the first number, it was destined to fight for the abolition of the Fleet and Marshalsea prisons and of capital punishment and to uphold the standard of national integrity and virtue. It succeeded with the first part of its programme, and while it has ceased its crusade against capital punishment it has consistently attacked abuses of all kinds. Throughout the world it is regarded as an exponent of English opinion scarcely inferior to the London *Times* itself. While it draws its materials as freely from the happenings of foreign politics as from the occurrences of English national life, it has nevertheless always judged external events from the English point of view and home affairs from a high moral standard.

At the time of its inception it was practically the only periodical which could be said truthfully to represent the attitude of the great mass of the British nation, absolutely free from party or governmental bias. Its humor, like its policy, has been typically English—so much so that it has been frequently misunderstood by foreign critical opinion, with the result that its insularity has lost for it the best work of non-English contributors. An exception to this rule was the engagement of Artemus Ward. The renowned French caricaturist Caran d'Ache has also drawn for it. A list of the Englishmen who have met weekly about the table on which most of them have carved their initials would include many of the best-known writers and artists. Among the former may be mentioned Douglas Jerrold, Thomas Hood, and Thackeray, who wrote for it until 1854; among the latter, Keene, Sambourne, Leech, Tenniel, Briton Rivière, Du Maurier, Harry Furniss, and Phil May. Lemon was editor from the beginning until 1870; the later editors have been Shirley Brooks (1870–74), Tom Taylor (1874–80), Sir F. C. Burnand (1880–1906), and Sir Owen Seaman (1906–). Consult M. H. Spielmann, *The History of Punch* (London, 1895), and G. S. Layard, *Shirley Brooks of Punch* (New York, 1907).

PUNCH (from ML. *punctuare, punctare,* to pierce, from Lat. *punctum, punctus,* point, from *pungere,* to pierce). A tool for cutting circular or other shaped pieces out of metal, wood, or other materials or simply for making holes. The simplest form of this instrument consists of a piece of steel formed at one end into a cylinder, the end of which is ground to a square cutting edge. The other end of the punch is made strong and thick, to receive blows from a hammer and to serve as a handle. Tubular punches are sometimes used which cut blanks for various purposes, gun wads or valves, which are retained for special work. Punches operated either by hand or power through a system of levers or toggle joints are also made where a die or punch fits accurately into a corresponding hole through which the material is forced. See DIES AND DIE SINKING; METAL-WORKING MACHINERY.

PUNC'TUA'TION (Fr. *ponctuation,* ML. *punctuatio,* marking with points, a writing, from *punctum,* point). In writing or printing, the use of certain marks, called points, to separate sentences and parts of sentences. Its most important office is that of preventing ambiguity or obscurity.

In Greek inscriptions and manuscripts generally there is no attempt to separate the words, and in early times no system of punctuation was employed. It is true that in some archaic inscriptions columns of dots are occasionally found separating words, but they have no reference to the pauses and cannot properly be called punctuation. However, even by the end of the fourth century B.C., readers found it convenient to indicate to a slight extent pauses by arbitrary signs, though books of that period seem to have known no division of words or use of diacritical signs. The development of an organized system of punctuation seems to have occurred at Alexandria. To judge from the papyri, the earliest mark is used to indicate a new paragraph. Here a slight space is left in the line (later a large initial is sometimes found), while below the line in which the pause occurs is drawn a short horizontal line (the so-called παράγραφος, *paragraphos*) which sometimes takes the form of a wedge. This sign is used in the plays to indicate a change of speaker, and in the papyrus of Bacchylides to mark in the odes the strophe, antistrophe, and epode. Another method was the employment of a dot or small circle, and we are told that Aristarchus of Byzantium systematized this use so that the point high above the line indicated a full stop, that low on the line a lesser pause, like a semicolon, and the point in the middle a comma. This system, however, though accepted by the grammarians, does not appear in the papyri, where the point is usually placed high, whatever its value.

In general it may be said that these and other diacritical signs seem to have been used chiefly in works of the poets, whose dialectic and archaic forms presented greater difficulties to the ordinary reader. The Greek manuscripts of later date show a system more like that now employed. About the ninth century the comma appears to denote the slight pause, while the high dot (·) indicates a colon or semicolon, and the full stop is denoted by a larger dot or double dot and a space. A little later the interrogation point (;) appears, though not very frequently. The Latin grammarians adopted the punctuation by dots from the Greeks, but seemingly modified the system slightly so as to give the middle dot the middle value and the lower the smallest. The oldest manuscripts, however, show no punctuation at all, and the later uncials show great variety and no recognized system. In the seventh century we find the equivalent to a comma, the semicolon with its modern value, and a full stop expressed by a more complex sign. In the Carolingian and later manuscripts the system is somewhat altered and approaches more closely that in common use, as the comma is introduced and an inverted semicolon to indicate a pause between comma and semicolon, while a sign of interrogation also appears. Quotation marks in various forms are found early in both Greek and Latin manuscripts.

All modern languages agree practically in the use of the same points, applied according to principles laid down by Aldus Manutius (1450–1515), but since his time, of course, extensively developed. Differences in detail between languages rest mainly on different methods of thought and construction, though some peculiarities are arbitrary. In Spanish a question or an exclamation has its special mark at the beginning as well as at the end. This peculiarity arose doubtless from the fact that on account of the variable position of a subject noun in Spanish it is not always easy to distinguish at first sight a declarative from an interrogative sentence. French has a special set of quotation marks, and German uses commas in normal position at the beginning and inverted commas at the close of a quotation. But the leading principles are universal. Liberal insertion of points is called close punctuation, and omission of all but those absolutely necessary is known as open punctuation. The latter practice probably prevails at present in the best English usage, although the only statement that may be made with certainty in this respect is that usage is not uniform.

Differing methods of pointing have been called rhetorical punctuation and grammatical punctuation, with the supposition that in the former case, for guidance in reading, each place of natural pause should be indicated by a distinctive point. It was probably this rhetorical or elocutionary consideration that led to the assignment of time values to the marks. The comma was said to indicate a pause long enough to count one, the semicolon two, the colon three, and the period four. In any case the reader's individuality may ignore punctuation. Consequently punctuation governed by purely grammatical circumstance seems likely to prevail increasingly, although it has not yet entirely superseded the other method. Another classification has been made, including, besides rhetorical and grammatical, etymological and reference punctuation; but, although the marks for the last two purposes are used in positions similar to those of real punctuation, their nature more nearly approaches that of diacritics.

The comma is used to mark the slightest actual turn or jointure in grammatical construction, and thus occurs much more frequently than any other point.

The semicolon is used after a clause when the turn in sense is too distinct to use merely a comma and not sufficient for a period; most frequently between clauses all or some of which contain commas.

The colon is now generally confined to an introductory function, especially at the transition point of the sentence.

The period is a full stop and marks the end of a sentence.

The dash is used to denote a sudden change in the construction, a sudden interruption or irregularity.

Marks of parenthesis are used to inclose interpolations in a sentence. Square brackets inclose an insertion not merely disconnected, but having no effect on the meaning of the context. An apostrophe marks the possessive or elisions. The use of various other marks is commonly explained in treatises on punctuation, including marks of reference, elision, emphasis, connection, and diacritics.

Bibliography. Among the fullest of the older treatises are: Goold Brown, *Grammar of English Grammars* (London, 1851; new ed., New York, 1857); John Wilson, *Treatise on Grammatical Punctuation* (5th ed., Boston, 1856). Recent works are: A. S. Hill, *General Rules for Punctuation* (Cambridge, Mass., 1878); F. H. Teall, *Punctuation* (New York, 1899); T. F. and M. F. A. Husband, *Punctuation: Its Principles and Practice* (ib., 1905); A. M. Smith, *Proofreading and Punctuation* (Philadelphia, 1905); Frances M. Perry, *Punctuation Primer* (New York, 1908); Horace Hart, *Rules for Compositors and Readers at the University Press* (Oxford, 1912). On the history of punctuation, consult Omont, *De la ponctuation* (Paris, 1881), and Maurice Prou, *Manuel de paléographie* (3d ed., ib., 1910).

PUNCTURE, LUMBAR. See LUMBAR PUNCTURE.

PUN′DIT, also **PAN′DIT** (from Skt. *paṇdita*, learned). The name given to a Brahman who is versed in the Sanskrit language and in the science, laws, and religion of the Hindus.

PUNICA FIDES, pū′nĭ-kȧ fī′dēz (Lat., Punic faith). A term used by the Romans to express treachery, in allusion to the popular conception of the Carthaginians.

PU′NIC WARS. The name commonly given to the three great wars waged between Rome and Carthage (q.v.). Of these the first (264–241 B.C.) ended with the cession of the Carthaginian part of Sicily to Rome; the second (218–201 B.C.) resulted in the surrender of Spain by Carthage to Rome; the third (149–146 B.C.) ended in the destruction of Carthage. The Latin word *punicus*, or *pœnicus*, was the name given by the Romans to the Carthaginians, in allusion to their Phœnician descent. See CARTHAGE; HASDRUBAL; HAMILCAR; HANNIBAL; ROME; SCIPIO.

PUN′ISHMENT (from *punish*, from OF., Fr. *punir*, from Lat. *punire*, *pœnire*, to punish, from *pœna*, punishment, expiation, pain, from Gk. *ποινή*, *poinē*, punishment; connected with Gk. *τίνειν*, *tinein*, Skt. *ci*, to repay). Pain or suffering inflicted because of some misdeed. In criminal law the word "punishment" is used to designate the penalty inflicted by the state upon a person for committing a criminal offense. The earliest forms of punishment were those which carried with them the idea of vengeance and were inflicted with the desire to do harm to him who had previously done harm. More recently, however, the idea of retribution has made way for the theories of prevention and reformation. The former of these theories insists that the state shall inflict upon a criminal only such punishment as will keep him from further wrongdoing and deter others from criminal acts. The latter theory regards the reformation of the criminal as the only legitimate design of punishment and maintains that when this is accomplished further punishment should cease. None of these three theories—of retribution, prevention, or reformation—holds absolute sway in our criminal codes. Generally there are traces of all three, although the tendency of recent development has been in the direction of reforming the criminal.

In the early history of society the infliction of punishment for crime was left in the hands of the person wronged or of his kin, clan, or tribe. The punishments inflicted were usually characterized by cruelty and were out of proportion to the offense committed. Indignities were frequently inflicted upon the body of a criminal after death. When, moreover, certain standards concerning the degree of offense came generally to be accepted, the punishment for the same offense varied according to the social rank of the injured party. In the course of time a system of fines was substituted for physical punishment. By the payment of a fine to the injured person or to his family the offender was made free from liability to further punishment.

With the increasing complexity of society and the development of the idea of the state, the right to punish was taken away from the offended party and vested in the state. Crimes came to be considered as offenses against the state, the social order, and punishment is now regarded as an act of social defense calculated to establish the inviolability of the law and to deter those who may be criminally inclined from overstepping the limits of legally permissible conduct.

Punishments are of varying nature; they may involve encroachment upon the life or physical integrity, on the personal liberty, on the property, or on the rights and privileges of an offender. To the first of these classes belong capital punishment and such generally obsolete punishments as the cutting off of tongue or hands. In the second class we find deportation, imprisonment, and compulsory labor. The third class includes fines and the confiscation or destruction, by the state, of an offender's property. As punishments of the fourth class the criminal is often deprived of political or civil rights belonging to citizenship, such as the electoral franchise, capacity to testify in courts of justice, or to hold office. Forms of punishment formerly in vogue, but now discarded among civilized nations generally, are mentioned under Torture.

Some of the qualities which ideal punishments should possess, to correspond to modern ethical standards, are the following: (*a*) Morality. Punishments should not stunt or destroy the moral sense of the culprit or of those witnessing the punishment. (*b*) Equality. Punishments should represent a damage or pain of equal importance or intensity to different offenders committing the same crime. This condition is difficult to fulfill, for the imposition of different punishments for one and the same crime seems to be a violation of democratic principles, while a fixed fine of, say, $100 for a specific offense represents a much severer punishment for a poor man than for a man of wealth. (*c*) Personality. The evil effects of punishment should be confined to the offender alone and not extend to innocent persons. (*d*) Elasticity. The punishment should be such that it can be varied to suit the various degrees of guilt. (*e*) Commensurability. The diverse punishments of the criminal code must be of such a kind that they may be compared with one another and thus permit the judge to choose among several penalties that which corresponds in severity to the gravity of the offense. (*f*) Reparability. It should be possible in case of judicial error to repair the injury done to a person unjustly condemned.

Sometimes the laws prescribe a definite penalty for a specific offense, and the judge then has no choice. Usually, however, he is permitted to elect among several penalties which the law permits for a given misdemeanor; he may choose, e.g., between "a fine of from $1 to $100 or imprisonment for a period not less than three days or more than three months." Theoretically the nature and method of punishment might be left entirely to the discretion of the judge; but this system is unknown in practice. Consult: A. M. Earle, *Curious Punishments of Bygone Days* (New York, 1896); Sir H. J. Maine, *Ancient Law: Its Connection with the Early History of Society and its Relation to Modern Ideals* (4th Amer. ed., ib., 1906); F. H. Wines, *Punishment and Reformation* (ib., 1910); Raymond Saleilles, *Individualization of Punishment*, translated from the second French edition by R. S. Jastrow (Boston, 1911); George Ives, *History of Penal Methods* (New York, 1914). See Capital Punishment; Criminology; Penology.

PUNJAB, pŭn-jäb′, or **PANJAB** (Hind., five rivers: the Jhelam, Chenab, Ravi, Sutlej, Beas). A northwest province of British India (q.v.) (Map: India, B 2). Of a gross area of 136,330 square miles 99,779 square miles are directly under British administration, the remainder being occupied by a number of feudatory native states, of which the largest is Bahawalpur. The extreme northern part of the province lies among the foothills and projecting spurs of the Himalaya, but the greater portion consists of an almost perfectly level plain sloping gently from an elevation of 1600 feet at the base of the mountains to less than 200 feet in the extreme southwest. This plain is traversed by the Indus (which flows on or near the west boundary) and its great tributaries, the Jhelam, Chenab, Ravi, and Ghara, or Sutlej (the chief affluent of which is the Beas), which all unite into the Panjnad before they enter the main stream near the southwestern boundary. The climate of the plains is excessively hot and for the most part dry between April and September, the temperature sometimes rising to 120°. The winters are cool, with occasional frosts at night. The rainfall, which occurs under the monsoons in June, ranges from 36 inches in the north to only 4 inches in the south, being in the greater portion insufficient for the needs of agriculture. Healthy vegetation is accordingly confined to narrow lands along the river courses, and the great interfluvial tracts, known as *doabs*, are covered only with a scanty jungle of scrub, here and there affording pasturage.

As in all parts of India, most of the inhabitants are engaged in agriculture. The soil as a rule is highly fertile and only lacks an adequate water supply. In the south there is practically a barren desert. In the extreme north good crops are usually raised without irrigation. There is a larger irrigated area in this province —11,589,778 acres in 1912–13—than in any of the other governmental divisions. This area has been greatly extended in recent years by the large irrigating enterprises of the government of India, the government canals supplying an area in 1912–13 of 7,026,031 acres. The area watered by wells was 3,601,882 acres, but reservoirs or tanks are almost wholly wanting. In the south the canal system of irrigation prevails and the irrigated areas fringe the river courses. In the northern half of the country wells are common, and the cultivated area is not limited to the proximity of the rivers. The Punjab has become noted for its wheat crops. It produces more wheat than any other province. The wheat-growing area was 8,766,689 acres in 1912–13. Rice, on the contrary, receives much less attention than in India generally; the area in 1912–13 was 741,901 acres. Areas planted to other important crops in the latter year were: grain, 3,400,919 acres; spiked millet, great millet, and millet, 3,909,317; maize, 1,097,989; barley, 1,006,715; all food grains and pulses, 20,405,340. Under oil seeds there were 1,093,690 acres; sugar cane, 367,373; fibres, 1,497,716 (including cotton, 1,442,929). Total area cropped, 24,159,016 acres. The general desert conditions are a serious disadvantage to pastoral pursuits, yet this industry receives considerable attention. In the drier portions of the country the most serviceable animals are camels, of which the Punjab contains over 60 per cent of all in British India. For live-stock statistics, see INDIA, *Stock Raising.*

Some manufacturing is engaged in, the Oriental domestic methods being most common. In 1912 there were 208 factories; average number of hands employed daily, 32,865. Among the chief products are muslins and other cotton goods, manufactures of camel's hair, and glazed tiles and pottery. The potter's art especially has degenerated under foreign influence. The province now has railroad connection with the three principal trade centres of India, Calcutta, Bombay, and Karachi. The Indus River affords water transportation, but railway competition has reduced this to a minimum. The principal imports into the Punjab from other parts of India include cotton goods (mostly European), sugar, rice, and iron. The leading exports are wheat, raw cotton, hides, grain and pulse, and rape and mustard seed. Over 90 per cent of the wheat passes through the port of Karachi.

The chief executive officer of the province is the Lieutenant Governor, who is appointed by the Governor General with the approval of the Secretary of State for India. The Lieutenant Governor has no executive council, but under the Government of India Act (1912) he appoints a legislative council of 27 members (11 official, 14 unofficial, and 2 experts).

The population of the Punjab directly under British administration in 1891 was 19,009,368; in 1901, 20,330,337; in 1911, 19,974,956. These figures include the population (about 390,000) of Delhi, with surrounding territory, which in 1912 was detached and made a chief commissionership. The population per square mile in 1911 was 200; that of the native states was, in 1901, 4,424,398; in 1911, 4,212,794. Since the Punjab lies at the northwest gateway of India, the various migrations and military expeditions from the west have passed through it, making it the scene of numerous conflicts. The result has been that in many respects it is different from the other portions of India. The Caucasian blood is more pronounced, as is also the military spirit. The Jats constitute a large part of the population. The Pathans have scattered settlements throughout the province, and the Beluchis have settlements on the lower Indus. Over one-half of the people are Mohammedans. A large number of Jats are Hindus. The Sikhs (q.v.) are an offshoot from the Hindu Jats. The caste system, as adopted by the Indus valley Jats, differs materially from the original system. The sikhs have endeavored without success to abolish caste. As in other parts of India, most of the population live in rural villages. The largest cities (after Delhi, which had 232,837 inhabitants in 1911) are: Lahore, the capital, 228,687; Amritsar, 152,756; and Multan, 99,243. For further statistics of population, see INDIA. In 1913 there were in the Punjab (including Delhi) 8526 schools of all grades, with 421,766 pupils (of whom 59,561 are female). For the history of the Punjab, see SIKHS; for the language, see PANJABI LANGUAGE AND LITERATURE.

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PUN'KIE (of uncertain etymology). One of the biting midgets of the family Chironomidæ and genus *Ceratopagon.* These flies are very minute, and one species (*Ceratopagon nocivum*) is the cause of considerable distress to hunters in the Maine woods, where it is called no-see-um. Other species are found in both North and South America. The larvæ feed on decaying animal or vegetable matter.

PUNNAH, pŭn'ȧ. A native state of India. See PANNA.

PUN'NETT, REGINALD CRUNDALL (1875–). An English zoölogist, born at Tonbridge, Kent, and educated at Clifton and at Caius

College, Cambridge. He was lecturer in St. Andrews University from 1899 to 1902, fellow of Caius College (1901), professor of biology at Cambridge (1909–12), and thereafter professor of genetics in the same university. He became a fellow of the Royal Society in 1912. In his field, mainly the study of heredity, he published, besides papers, *Mendelism* (1905).

PUNO, pōō′nō. The southeasternmost department of Peru (Map: Peru, C 6). Area, about 41,200 square miles. The north part of the department is occupied by the Carabaya Range of the eastern cordillera of the Andes, whose forest-covered slopes belong to the region of the Montaña and give rise to the river Madre de Dios. The south half belongs to the basin of Lake Titicaca, a part of which lies in the east of the department. The greater part of the inhabitants, chiefly Aymara Indians, live in the lofty Titicaca basin, where the climate is cold and but little agriculture can be carried on. The chief occupations are the mining of gold and silver and cattle raising, especially llamas and vicuñas. Pop., 1896, 537,345; 1910 (est.), 403,000. The capital is Puno (q.v.).

PUNO. The capital of the Department of Puno, Peru, 100 miles east of Arequipa, on the west shore of Lake Titicaca and on the Southern Railway of Peru (Map: Peru, D 7). It is the centre of an extensive transit trade between Bolivia and other countries. There are gold, silver, and copper mines in the vicinity. Pop. (est.), 11,081.

PUN′SHON, WILLIAM MORLEY (1824–81). An English Wesleyan Methodist minister. He was born at Doncaster, Yorkshire, became a local preacher in the Methodist church, entered the ministry in 1844, and was sent for a few months to the theological institution at Richmond. His first regular parish was Whitehaven (1845), and he held pastorates in Newcastle-on-Tyne, Sheffield, Leeds, London, and Bristol. In 1868 he was sent to Canada, where he was president of the conference for five successive years, and was instrumental in building churches, strengthening Victoria University, and enlarging the denomination. In 1873 he returned to England. In 1875 he became secretary of the Wesleyan Methodist Missionary Society. He published volumes of addresses, lectures, and sermons and one volume of poems. Consult F. W. Macdonald, *Life of William Morley Punshon* (3d ed., London, 1888), and J. Dawson, *Morley Punshon, the Orator of Methodism* (ib., 1906).

PUNT, pōōnt (Egypt. *Puĕnt*). A country on the Red Sea, often mentioned in the hieroglyphic inscriptions, whence the Egyptians obtained incense, gold, ebony, ivory, leopard skins, ostrich feathers, and other commodities. The earliest recorded voyage to Punt was under King Assa of the fifth dynasty, and King Se'ankh-ka-rê of the eleventh dynasty sent an expedition which, crossing the desert from Koptos to the Red Sea, built a ship and sailed down the coast to Punt. Expeditions were also sent thither by Amenemhat II, Thothmes III, Ramses III, and other monarchs. Queen Hatshepsut (Hatasu), who sent a whole fleet to Punt, caused the details of the voyage to be depicted upon the walls of the temple of Deir el Bahri, with interesting representations of the inhabitants of the land and of their dwellings. The question as to whether Punt was on the Asiatic or the African side of the Red Sea has caused much discussion, but from the evidence of the monuments it seems to have corresponded with the modern Abyssinian and Somali Coast. Consult: Johannes Dümichen, *Die Flotte einer ägyptischen Königin* (Leipzig, 1868); Müller, *Asien und Europa* (ib., 1893); Adolf Erman, *Life in Ancient Egypt* (London, 1894); Naville, "Deir el-Bahri," in *Egypt Exploration Fund, Memoirs XII, XIII, XIV, and XIX* (London, 1894 et seq.); J. H. Breasted, *A History of the Ancient Egyptians* (New York, 1908).

PUNT, pŭnt (AS. *punt*, from Lat. *ponto*, punt, pontoon, from *pons*, bridge). A heavy, oblong, flat-bottomed boat, propelled by a pole thrust against the bottom of a river or lake and useful where stability and not speed is needed. It is a primitive form of boat, found in many countries, notably from ancient times on the waterways of Mexico. Punting has, however, become a popular sport, especially in England, where the conditions of climate and the nature of the rivers are particularly favorable to it. The Thames Punting Club was revived in 1890 and holds championship and other races. This club differentiates punts from other partly similar boats by defining a punt as "a flat-bottomed craft without stem, keel, or stern post, and with the width at each end at least one-half of the width of the widest part." Amateur punting championships have been held in England annually since 1886, and professional races since 1876. See BOAT.

PUNTA ARENAS, pōōn′tȧ ȧ-rā′nȧs. A port of Chile, situated on the northwest shore of the Strait of Magellan, capital of the Territory of Magallanes. The town has broad streets, several fine buildings, and electric lighting. There are coal, copper, and gold mines and considerable timber in the vicinity. Stock raising is the chief occupation. Punta Arenas is a port of call and coaling station for all steamers passing through the strait, and has a trade in wool, skins, beef, and other cattle products. It is the seat of a United States consul. Pop., 1907, 12,199.

PUNTARENAS, or **PUNTA ARENAS.** The principal seaport on the Pacific coast of Costa Rica, situated on the Gulf of Nicoya, 44 miles west of San José (Map: Central America, E 6). Its harbor is provided with an iron breakwater, but large vessels anchor outside. It is the western terminus of the transcontinental railroad from Port Limón. It has steamship communication with the United States. In 1913 its exports included coffee, rubber, tortoise shell, and silver. It is the seat of a United States consular agent. Pop. (est.), 4735.

PUNXSUTAWNEY, pŭn̲ks′sụ-ta̤′nĭ. A borough in Jefferson Co., Pa., 106 miles by rail northeast of Pittsburgh, on the Buffalo, Rochester, and Pittsburgh and the Pennsylvania railroads (Map: Pennsylvania, D 5). Among the features of interest are the two hospitals, a sanitarium, the John A. Weber Memorial Manual Training School, and post-office and high-school buildings. The manufactories include glassworks, foundries, ironworks, machine shops, and planing, flour, feed, and silk mills. A high-grade bituminous coal is mined in the surrounding region, and there are some farming and stock-raising interests. Punxsutawney and Clayville boroughs were consolidated and incorporated in 1907 as Greater Punxsutawney. Pop., 1900, 6746; 1910, 9058; 1914 (U. S. est.), 10,043.

PU'PA (Lat., doll, puppet). That stage in the life of an insect having perfect metamorphoses which intervenes between the larva and the adult. See INSECT; METAMORPHOSIS.

PUPIE'NUS (M. CLODIUS PUPIENUS MAXIMUS). Joint Emperor of Rome with Balbinus for a few months in 238. They were elected by the Senate when the news came that the two Gordians had died in Africa, and both were before long assassinated by the soldiery.

PUPIL, OF THE EYE (from Lat. *pupilla*, a ward, minor, dim. of *pupa*, a girl, lass). The aperture in the iris through which light penetrates to the interior of the eyeball. The normal pupil is round and constantly varies in size according to the requirements of accommodation and the necessity for regulating the amount of light. Contraction and dilation of the pupils are effected through a complex nervous mechanism, acting on the sphincter and radiating fibres of the iris. Irritation of the sympathetic nerves dilates the pupil, irritation of the oculomotor fibres contracts it. It dilates in the dark and contracts in bright light and when the eyes converge upon near objects. It dilates when the skin of the neck is pinched or pricked because of irritation of the cervical sympathetic nerves. Certain drugs have the power of dilating or contracting the pupil. (See MYDRIATICS; MIOTICS.) Normally the pupils are equal in size, and their edges are smooth; but inflammation of the iris may prevent their natural movement on one side or the other, making them unequal in outline. Differences in refractive conditions of the two eyes will sometimes account for unequal pupils (*anisocoria*). *Hippus* is a term applied to the rapid contraction and dilatation of the pupils on sudden exposure to light; it may be seen in health, but it is an important diagnostic sign in the early stages of meningitis, hysteria, and disseminated sclerosis. A transient, rapid, unsymmetrical dilation of the pupil has been put forward as an important diagnostic sign in early tuberculosis. It is believed to be owing to irritation of the upper thoracic sympathetic ganglion by tuberculous glands. The behavior of the pupil in locomotor ataxia is an important diagnostic sign. This, the so-called Argyll Robertson (a Scottish physician, 1837–1900) pupil, does not respond to light, but does react to accommodation. A similar pupillary phenomenon is observed also in cerebral syphilis and progressive paresis. It is thought to depend on sclerotic changes in the fibres of that portion of the nucleus of the third nerve which governs the light reflex, the part that presides over accommodative contraction not being implicated. In optic atrophy and glaucoma the pupils are widely dilated and fixed because the retinal fibres are unresponsive to light. The pupils are dilated in shock, collapse, profound anæsthesia, anæmia, brain tumor, or abscess, the later stages of meningitis, in aortic regurgitation, asphyxia, and postdiphtheritic paralysis of the third nerve. During sleep and in old age the pupils are contracted. See EYE.

PUPIN, pū-pēn', MICHAEL IDVORSKY (1858–). An American physicist and inventor, born at Idvor, southern Hungary, of Servian ancestry. He was educated at the village school of his native town and at a military school at Prague and came to America in 1874. He graduated from Columbia College in 1883, and studied mathematics and physics at Cambridge and at Berlin (Ph.D., 1889). While abroad, he held the John Tyndall Fellowship of Columbia. Upon his return to America he was appointed instructor in mathematical physics at Columbia University, in 1892 adjunct professor of mechanics, and in 1901 professor of electromechanics. In 1911 he became director of the Phœnix Research Laboratories. He was elected a member of the National Academy of Sciences in 1906. Professor Pupin's most important researches were in electrical resonance, in theoretical and experimental consideration of the magnetization of iron, and in electrical-wave propagation, a field in which he applied his researches to long-distance telephony and multiplex telegraphy. (See TELEPHONE.) The Bell Telephone Company in the United States and the German telephone interests in Europe acquired rights in Professor Pupin's telephone patents. Upon the outbreak of the Balkan War (1912), Pupin was appointed by the Servian government Honorary Consul General in New York, and at that time and also during the Great European War he was an active exponent of the Servian cause. In the summer of 1915 he organized a group of Columbia students who went to Servia for relief work.

PUPIP'ARA (Neo-Lat., from Lat. *pupa*, doll, puppet, pupa + *parere*, to bring forth). A so-called series of flies, including those forms in which the female gives birth to full-grown larvæ which immediately transform to pupæ. The term is really erroneous, and the group is not a natural one, the points of resemblance, as Müggenberg suggests, being probably the results of convergence. The series comprises four families, the Hippoboscidæ or bird ticks (see TICK; FOREST FLY), the Braulidæ or bee lice, the Streblidæ, and the Nycteribiidæ or bat ticks. (See TICK.) The flies of this group have very abnormal habits and live by sucking the blood of mammals, birds, and bees; in some cases they are wingless parasites. The family Braulidæ consists only of a single species, *Braula cœca*, a minute insect which lives on bees. The adult is said to deposit a pupa in the cell of a bee by the side of a young bee larva. The queen bee is said to be especially affected by the adult Braulas. The series Pupipara corresponds with the group Eproboscidæ, which is ranked as a suborder of the Dipters.

PUPPER, pụp'pẽr, JOHANN. See GOCH, JOHANNES VON.

PUPPET (OF. *poupette*, doll, from Lat. *pupa*, doll, puppet). A small jointed figure, commonly of wood or cardboard, representing a character on the stage of a puppet theatre, and moved with strings, rods, or otherwise by a concealed agent. For the dialogue in this mimic drama, the invisible operator varies his voice as he takes the different rôles. The more elaborately installed puppets are now commonly called marionettes, from the French term *marionnettes*, a diminutive, perhaps through the form *mariolettes*, of Marie, and denoting originally little figures of the Virgin Mary. Of the simpler form of puppets, the familiar representatives are Punch and Judy. See PUNCH.

The origin of this form of entertainment is lost in antiquity. It was known to both Greeks and Romans. Figures with movable limbs have been found even in the tombs of ancient Egypt and of Etruria, though many of these were probably only dolls for children and afford little evidence of a puppet drama. Of this perhaps the earliest development was in India. It is significant that the Sanskrit equivalent for stage manager, *sūtradhāra,* literally means "thread holder." In China puppet shows are likewise known, and also an adaptation of them in which the movable figures cast their shadows upon a curtain, whence the name *ombres chinoises.* See SHADOW PLAY.

Puppet shows have received perhaps their highest development among the Javanese, who may have derived the idea from India. The Javanese puppets are ordinarily about 2 feet high and of elaborate, usually grotesque formation. They are used for shadow plays as well as for direct representation, and the dramas in which they are employed are of great elaboration, often of religious and ceremonial significance. Among the Turks, too, and in Mohammedan countries generally, the puppet show is a popular entertainment, in which, it is asserted, the marionette actors exhibit a style of immorality even more atrocious than does our own Punch. Puppet shows were used in the Middle Ages by the Christian Church, among other dramatic means, such as miracle plays. In England these religious puppet plays were called *motions.* The earliest exhibitions of this kind consisted of representations of stories taken from the Old and New Testaments or from the lives and legends of saints. In Germany puppets are said to have been known as early as the twelfth century. Lessing and Goethe in their day thought the subject not unworthy of their serious artistic attention. A favorite piece in the German puppet theatres early in the nineteenth century was *Doktor Johannes Faust,* which was published at Frankfurt in 1846. In France the introduction of regular marionettes is commonly credited to Pierre Brioché, who had a puppet show on the Pont Neuf at Paris in the reign of Louis XIV, but there is reason to believe that they were really known there much earlier. They have been especially popular at Lyons, where the character of *Guignol* was invented, but naturally they are a familiar adjunct to fairs and other periodic festivities generally.

Of the marionette drama of western Europe the real home, however, seems to be among the Italians. Puppet theatres have been known for centuries at Naples, Milan, and elsewhere, and in America the best-maintained marionette shows are among Italian immigrants. The dialogue in these mimic theatres is in its detail largely extemporized. The favorite themes are legends of the court of Charlemagne. There is, moreover, a considerable literature for the marionette stage. Thus, besides what has already been mentioned, may be cited such German collections as S. A. Mahlmann, *Marionettentheater* (Leipzig, 1806), Karl Engel, *Deutsche Puppenkomödien* (Oldenburg, 1874–92), Arthur Kollmann, *Deutsche Puppenspiele* (Leipzig, 1891), and also some of the best-known pieces of Maeterlinck, to say nothing of his imitators. A distinction might, however, properly be drawn between plays actually for marionette performance and the so-called "plays for marionettes," which merely form a modern literary type subtly defined through the associations of the name. On the puppet theatre there are observations in the *Spectator* and the *Tatler,* and Addison wrote a Latin poem entitled *Machinæ Gesticulantes* (Anglice, *A Puppet Show*). Consult, on the history of the subject: Charles Magnin, *Histoire des marionnettes en Europe depuis l'antiquité jusqu'à nos jours* (2d ed., Paris, 1862); Richard Pischel, *Die Heimat des Puppenspiels* (Halle, 1900); E. Maindron, *Marionnettes et guignols: La poupée dansante et parlante depuis l'antiquité jusqu'à nos jours* (Paris, 1900); Louis Lemercier de Neuville, *Théâtre des marionnettes* (2 vols., ib., 1904); id., *Souvenirs d'un montreur de marionnettes* (ib., 1911), containing a bibliography; K. F. Floegel, *Geschichte des Groteskkomischen: Ein Beitrag zur Geschichte der Menschheit* (2 vols., Munich, 1914).

PUQUINA, pōō-kē′nȧ. A people of very low grade of culture and intelligence, formerly living upon certain islands in Lake Titicaca and the adjacent shores in southern Peru. Their language constitutes a distinct stock and is said to have been at one time one of the three general languages of Peru. Consult: D. G. Brinton, *The American Race* (New York, 1891); Raoul de la Grasserie, *Langue Puquina* (Leipzig, 1894); J. T. Polo, in Sociedad de Geografía de Lima, *Boletín,* vol. x (Lima, 1901).

PURACÉ, pōō′rȧ-sā′. A volcano rising from the Cordillera Central in Colombia, 220 miles southwest of Bogotá and immediately east of the town of Popayán. Its present height is about 15,500 feet, but previous to 1849, when its top was blown off by an explosion, it was considerably higher.

PURANA, pōō-rä′nȧ (Skt., ancient lore). The name of a class of late poetic Hindu works of mixed cosmogonic, epic, and didactic character. The word *purāṇa* occurs frequently in the prose texts of the Veda as a designation of the Veda's own cosmogonic and legendary lore; the name is also given to the great epic, the *Mahābhārata* (q.v.). But in its most distinctive sense the word refers to a class of writings which certainly do not date before the sixth century A.D. and some of which may be as late as 1500 A.D. The existing Puranas seem to be sectarian religious manuals for the people, written in the interest of either the worshipers of Vishnu (q.v.) or Siva (q.v.). Though the fundamental Hindu Triad, Brahma, Vishnu, and Siva, is recognized, the Vishnuite Kurma-Purana does not hesitate to say: "Vishnu is the divinity of the gods, Siva of the devils"; to Brahma all alike refer only in a perfunctory fashion. According to ancient tradition the ideal Purana is divided into five parts: (1) primary creation, or cosmogony; (2) secondary creation, or the destruction and rebuilding of worlds; (3) genealogy of gods and patriarchs; (4) *Manvantaras,* the periods of reigns of Manus; (5) the history of the dynasties of kings. Though no extant Purana is so divided, yet the subject matter roughly follows that order. The entire type of composition is of secondary importance; it borrows its themes very largely from the epic literature and represents religion, practices, and legends in an exaggerated, fantastic, often distorted fashion. The actual light which the Puranas shed upon the antiquity they profess to illumine is very small. The number of Puranas is said to be 18, in the following order: Brahma, Padma, Vishnu, Siva, Bhagavata, Naradiya, Markandeya, Agni, Bhavishya, Brahmavaivarta, Linga, Varaha, Skanda, Vamana, Kurma, Matsya, Garuda, Brahmanda. Some lists omit the Agni and replace it by the Vayu-Purana. Of these the second, third, fifth, sixth, tenth, seventeenth, and probably the first are Puranas of the Vishnu sect; the fourth, eighth, thirteenth, fifteenth, and sixteenth belong to the Siva sect. The others are not so well defined. A great many of the Puranas have been edited and published, especially in the collection of texts published in Calcutta under the name of *Bibliotheca Indica*. One of the best-known English translations is that of the Vishnu-Purana by Wilson, edited by Fitzedward Hall (5 vols., London, 1864–77). The first nine books of the Bhagavata-Purana were translated into French by Burnouf (3 vols., Paris, 1840–47). Among the recent English translations the following deserve to be noted: *Markandeja puranam* (Calcutta, 1896); M. N. Dutt, *Agni puranam* (2 vols., ib., 1903–04); Pargiter, *Mārkaṇḍeya puranam* (with notes, ib., 1904); *Ganda puranam* (ib., 1908); *The Purāṇa Text of the Dynastics of the Kaliage* (with introduction and notes, London, 1913). Consult: Roussel, *Cosmologie hindoue d'après le Bhāgavata Purāna* (Paris, 1898); H. H. Wilson, *Puranas, or an Account of their Contents and Nature* (2d ed., Calcutta, 1898); Paul and Neumann, *Krichnas Welteingang: ein indischer Mythos in zwanzig Andachten aus dem Vischnupurānam übertragen* (Munich, 1905); Jahn, *Das Saurapurāṇam, ein Kompendium spätindischer Kulturgeschichte und des Sivaïsmus* (Strassburg, 1908); A. A. Macdonell, *History of Sanskrit Literature* (London, 1913).

PURBACH, pōōr′bȧG, **PEURBACH,** poir′-bȧG, or **PEUERBACH,** poi′er-bȧG, GEORGE VON (1423–61). An Austrian mathematician and astronomer, born near Linz. He studied in Vienna and traveled in Germany, France, and Italy, where he delivered astronomical lectures at Ferrara, Bologna, and Padua. In 1454 he was astronomer to King Ladislas of Hungary and somewhat later was made professor of mathematics at the University of Vienna and with Regiomontanus was one of the leaders in mathematical thought in his century. Purbach compiled a table of sines, taking $60 \cdot 10^4$ for unity or the length of the radius, and thus prepared the way for decimal fractions. The table was completed after his death by his pupil Regiomontanus. Purbach also calculated new tables of the planets and gave a new list of the fixed stars. He wrote: *Tractatus super Propositiones Ptolemæi de Sinubus et Chordis* (1541); *Theoricæ Novæ Planctarum* (1488 and several later eds.); *Sex Priores Libri Systematis Almagesti* (1496, 1550); *Institutiones in Arithmeticam* (1511); *Tabulæ Eclipsium super Meridiano Viennensi* (1514). With Regiomontanus he wrote an *Epitome in Cl. Ptolemæi Magnam Compositionem* (1543). Consult: Schubert, *Peuerbach und Regiomontanus* (Erlangen, 1828); Fiedler, *Peuerbach und Regiomontanus, eine biographische Skizze* (Leobschütz, 1870).

PUR′CELL. A city and the county seat of McClain Co., Okla., 33 miles south of Oklahoma City, on the Atchison, Topeka, and Santa Fe and the Gulf, Colorado, and Santa Fe railroads (Map: Oklahoma, D 3). It is situated in a farming district, producing chiefly alfalfa, cotton, small grain and corn, and it has oil and flour mills and elevators. Purcell adopted the commission form of government in 1911. Pop., 1900, 2553; 1910, 2740.

PURCELL, HENRY (1658–95). One of the most eminent of English musicians. He was born at Westminster and was the son of Henry Purcell, one of the gentlemen of the chapel royal appointed at the Restoration. He lost his father at the age of six and was indebted for his musical training to Cook, Humphreys, and the famous English Church organist and composer, Dr. Blow. His compositions at a very early age showed evidence of talent. In 1680 he was chosen to succeed Dr. Christopher Gibbons as organist of Westminster Abbey, and in 1681 he was made organist of the chapel royal. He wrote numerous anthems and other compositions for the Church, which were eagerly sought after for the use of the various cathedrals, most of which have retained their place and popularity to the present day. Purcell's dramatic and chamber compositions are even more remarkable. Among the former may be mentioned his music to *The Tempest*, his songs in Dryden's *King Arthur*, his music to Howard's and Dryden's *Indian Queen*, to Urfey's *Don Quixote*, and his *Fairy Queen*, the manuscript of which, long lost, was found in 1901. A great many of his cantatas, odes, glees, catches, and rounds are yet in demand throughout England. In 1683 he composed 12 sonatas for two violins and a bass. Purcell studied the Italian masters deeply and often made reference to his obligations to them. In originality and vigor, as well as harmony and variety of expression, he far surpassed both his predecessors and his contemporaries. His Church music was collected and edited from the original manuscript by Vincent Novello, in a folio work which appeared in 1826–36, with a portrait and essay on his life and works. He was regarded as the father of what has since come to be recognized as English melody. He died of consumption in London and was buried in Westminster Abbey. Consult: J. F. Runciman, *Purcell* (London, 1909); W. H. Cummings, *Purcell* (ib., 1911); P. Scholes, *Life of Purcell, the Master Musician* (New York, 1915).

PURCELL, JOHN BAPTIST (1800–83). An American Roman Catholic bishop. He was born at Mallow, Ireland, but early came to the United States. He studied at Asbury College (Baltimore) and at Mount Saint Mary's College (Emmitsburg, Md.), where, after study abroad, he became professor of moral philosophy and later president. In 1833 he became Bishop of Cincinnati, in 1839 assistant at the pontifical throne, and in 1850 Archbishop of Cincinnati.

PUR′CHAS, SAMUEL (c.1575–1626). An English clergyman and author. He was born at Thaxted, Essex, graduated from St. John's College, Cambridge (1600), and held several livings, becoming chaplain of St. Martin's, Ludgate, London. Having inherited many unpublished narratives from Hakluyt, he afterward devoted himself entirely to literary work. His works are: *Purchas, His Pilgrimage, or Relations of the World and the Religions Observed in All Ages* (1613), a compilation of the reports of voyagers, some 1200 authors being consulted; *Purchas, His Pilgrim. Microcosmus, or the History of Man. Relating the Wonders of His Generation, Vanities in His Degeneration, Necessity of His Regeneration* (1619); *Hakluytus Posthumus, or Purchas His Pilgrimes, Containing a History of the World in Sea Voyages and Land-Travells by Englishmen, and Others* (4 vols., 1625, reprint 20 vols., Glasgow, 1905–07). This work contains the matter left by Hakluyt, and is valuable, despite many errors.

PURCHASE. A mechanical contrivance of pulleys and ropes for gaining power. See BLOCK; PULLEY; TACKLE.

PURCHASE. In its technical legal sense, the act by which a person acquires an estate in land in any way other than by inheritance, where the heir is substituted in place of his ancestor by operation of law. Thus, one who acquires lands by gift or by devise is a purchaser, as well as one who buys it for a valuable consideration. See SHELLEY'S CASE, and consult the authorities referred to under REAL PROPERTY.

In a popular sense the word "purchase" denotes the act of buying any kind of property, the purchaser being called the *vendee* and the seller the *vendor*. See SALE.

PURCHASE SYSTEM. A former system of obtaining commissions in the British army, abolished by royal warrant in July, 1871. The system did not exist in the Royal Artillery, Engineers, Marines, 19th to 21st regiments of cavalry, and the 101st to 109th regiments of foot. Regulations fixed the value of the different grades as follows:

Lieutenant colonel	£4,500
Major	3,500
Captain	1,800
Lieutenant	700
Cornet or ensign	450

In practice much higher prices would often be paid, particularly in the Guards regiments. No rank above lieutenant colonel could be purchased. The United States Army Regulations provide five different ways by which an enlisted man may be discharged before the expiration of his term of enlistment. One of these is "discharge by purchase," the rules and prices governing such discharge being published from time to time by the War Department.

PURCHAS JUDGMENT. A celebrated ecclesiastical judgment rendered by the judicial committee of the Privy Council in Herbert *v.* Purchas, an appeal from the Canterbury Court of Arches brought in 1871. The defendant or respondent was charged with popish practices in connection with public services conducted by him at St. James's Chapel, Brighton, England. The principal offenses charged were the use of the mixed chalice, of a cap or biretta, of "holy water," and of wafer bread in the Eucharist, the wearing of certain vestments, and the turning of his back to the people at certain stages of the service. The decision of the court was adverse to Mr. Purchas on all points except that relating to the biretta. The judgment was rendered on an ex parte hearing, as the respondent was provided with funds to procure counsel only after the decision was pronounced; his petition for a rehearing of the case was refused, and the course of the court in so doing was the subject of much unfavorable comment. Mr. Purchas was compelled to pay the costs and admonished to discontinue the prohibited practices. He refused to comply and in 1872 was suspended and his property sequestrated to pay the costs of the suit.

PURDUE (pẽr-dōō′) **UNIVERSITY.** A coeducational State institution of higher learning at Lafayette, Ind., established in 1869 and named for John Purdue, an early benefactor. Its income is derived chiefly from the land grant of 1862 and from the Morrill and Hatch acts and State appropriations and amounted in 1914 to $567,070. The university is in effect an Indiana institute of technology. It embraces seven schools: Mechanical Engineering, Civil Engineering, Electrical Engineering, Chemical Engineering, Agriculture, Science, and Pharmacy. Students in each of the schools are required to spend an average of three hours a day in laboratory, shop, or field. It confers the degrees of bachelor of science and pharmaceutical chemist in course, and the following degrees for advanced work: master of science, mechanical, electrical, civil, and chemical engineer. In 1914 there were 2252 students and 188 instructors. The university has 279 acres of land in its campus and farm. Its endowment was $340,000, its grounds and buildings were valued at $1,403,000, and the total value of its property was $1,950,950. The library contained 40,000 volumes. The president in 1915 was W. E. Stone, LL.D.

PURE-FOOD LAW. A law passed by the Congress of the United States in June, 1906, and which went into effect on Jan. 1, 1907. It prohibits misrepresentation and adulteration and the misuse of preservatives in the preparation of foodstuffs and drugs. A fine not to exceed $500 or one year's imprisonment or both is the penalty for the first offense and for each subsequent offense and conviction a fine of not less than $1000 or one year's imprisonment or both. The administration of the law is in the hands of the United States Department of Agriculture with the collaboration of the Treasury Department and the departments of Commerce and Labor. For the provisions of the law, see ADULTERATION; FOOD.

PUREQUE. See GUITAR FISH.

PURGATION. See COMPURGATION.

PUR′GATIVES (Lat. *purgativus*, cathartic, from *purgare*, to cleanse, from *purus*, pure + *agere*, to drive, to do). Medicines which, within a comparatively short time after administration, produce a more or less fluid evacuation of the bowels. These drugs act partly by stimulating the peristaltic motion (q.v.) of the intestine, whereby the contents of the bowel are hurried in their passage to the rectum, and partly by determining the passage of a large amount of fluid into the intestine from the blood vessels. They may be classified as follows: 1. *Laxatives* (see LAXATIVE). 2. *Simple purgatives*, including aloes, rhubarb, cascara sagrada, senna, and ox gall. 3. *Drastic purgatives*, such as jalap, scammony, gamboge, croton oil, colocynth, elaterium, and calomel. Small doses of the drastic purgatives act as mild cathartics; when taken in large doses, they act as irritant poisons and are employed when milder purgatives have proved inefficient or when it is necessary to remove a large quantity of fluid from the system, as in dropsical affections. Certain of these drugs, as jalap, elaterium, and scammony, are called *hydragogue* cathartics because of the large amount of secretion they excite. 4. *Saline purgatives.* These also increase the secretion of intestinal fluid and hinder its reabsorption, so that a large amount of it accumulates in the bowel and excites gentle peristalsis and a free evacuation. The salines are largely used as habitual purgatives. They form the essential ingredient of most purgative mineral waters (q.v.). In this class are sulphate of magnesia, sulphate of soda, phosphate of soda, and the potassio-tartrate of soda either in simple solution or in the form of Seidlitz powder (q.v.). 5. *Cholagogue purgatives* are those which have a stimulating effect either on the secretion or flow of the bile and produce green-colored or "bilious" stools. Several of the drugs already mentioned possess this property. Among the cholagogues most frequently employed are podophyllin, calomel, mercury, and the phosphate and sulphate of soda. Consult W. H. White, *Materia Medica* (13th ed., London, 1914).

PURGATORIO, pōōr'gȧ-tō'rē-ō (It., Purgatory). The second part of Dante's *Divina Commedia*.

PUR'GATORY (Late Lat. *purgatorium*, from *purgare*, to cleanse). In theology, the condition or place in which souls of the baptized who die guilty of venial sins or liable to temporal punishment for sins are cleansed and made meet to enter the purity of heaven. "All who die at peace with the church, but are not perfect, pass into purgatory." Such souls are still linked by sympathy with the church on earth and may be aided by the prayers of Christians and especially by the sacrifice of the Mass in their behalf. The belief in purgatory was declared by the Council of Trent to be a matter of Catholic faith. The belief was laid down as a dogma by Gregory the Great (604). The doctrine is based by Catholic theologians on biblical passages using fire as the symbol of purification (Mal. iii. 2; Matt. iii. 11; 1 Pet. i. 7), the late Jewish belief in prayers for the dead (2 Macc. xii. 40 ff.; Tobit iv. 18; see PRAYER FOR THE DEAD), and the evidences of the belief in the early Church. In the Middle Ages the belief in purgatory became universal, and Aquinas, Bonaventura, Gerson, and other theologians held that the fire was material. The Greek church holds to an intermediate state in which the soul is fitted for heaven and may be benefited by the prayers of the living, but refused to affirm material fire. The early reformers—the Cathari, the Waldenses, Wiclif, and his followers—denied the doctrine. Protestant theology rejects it on the ground that it is not taught in the Bible and that the conception of salvation by faith leaves no room for a separation of the faithful from God after death. Consult: W. Barrows, *Purgatory Doctrinally and Historically Opened* (New York, 1882); J. Bautz, *Das Fegfeuer* (Mainz, 1883); Louvet, *Das Fegfeuer* (Paderborn, 1895); William Allen, *Souls Departed* (new ed., St. Louis, 1901); A. J. Mason, *Purgatory* (London, 1901). See ESCHATOLOGY; INTERMEDIATE STATE.

PURG'STALL, JOSEPH HAMMER-. See HAMMER-PURGSTALL.

PURI, pōō'rē. See JAGANNATH.

PURIFICA'TION (Lat. *purificatio*, from *purificare*, to make pure, from *purus*, pure + *facere*, to make). In a biblical sense, the act through which an individual became fit to approach the deity or regained his place in the community after having been excluded from it by some disability. Purification consisted chiefly in ablutions, but these were sometimes accompanied by special sacrifices as expiations. Priests and Levites were consecrated for the divine service by "purification" (Lev. viii), and certain religious acts could be performed only after ablutions. Generally no one was allowed to enter the temple or synagogue without washing or "sanctifying" himself. In the postexilic period washing was considered by some (as the Pharisees and Essenes) one of the chief duties of piety. Apart from the temple service, however, many other things required purification. (See UNCLEANNESS.) It is a mistake to assume that the origin of laws of purification is hygienic; they are merely phases of the general notions of taboo (q.v.). The question of health naturally enters later, in the reflective age, but has no force in primitive times. Laws similar to the Jewish are found among Mohammedans, and with Hindus and Persians laws of purification are even more exacting.

PU'RIM. One of the later Jewish festivals. According to the Book of Esther this festival was instituted to commemorate the deliverance of the Jews of Persia from a massacre with which they were threatened in the days of Xerxes (485–465 B.C.) at the instigation of Haman, the King's prime minister. It is celebrated on the fourteenth and fifteenth of the month Adar and is preceded by a day of fasting as preparation. (Cf. Esther iv. 15–17.) Scholars who hold that the Book of Esther (q.v.) is largely or purely fictitious think that it may have been written to justify and account for a fast and festival the origin of which was lost in obscurity. What the earlier significance of fast and festival was can only be conjectured in the absence of definite data. They are thought to be of Babylonian origin. The occurrence in the spring suggests a solar festival, the fast representing the death of winter, while the festival marks the joyous return of spring. Thus interpreted, Haman and Vashti symbolize the disappearance of the old year; Mordecai and Esther, hailed as King and Queen, are the new favorites who bring in fertility and renewal of vegetation. Mordecai is regarded as a derivative of Marduk, the chief god of Babylon; Esther is thought to be a form of Ishtar, the Babylonian goddess; while Haman is supposed to represent the Elamitish divinity Humman. It is possible that this Babylonian festival, originally celebrating the deliverance from Elamitish power, survived through the Persian period and received new features. The Feast of Purim corresponds in time with a festival, mentioned in the Books of the Maccabees, in celebration of a victory gained by Judas Maccabæus, on the thirteenth of Adar, 161 B.C., over Nicanor (1 Macc. vii. 49; 2 Macc. xv. 36). This seems to have been earlier a festival in honor of the dead. See FESTIVALS.

The name Purim is explained in the Book of Esther as "lots," and the application of it to the festival as due to the fact that Haman cast lots to determine a day favorable for the extermination of the Jews (Esther iii. 7; ix. 26). This is probably merely a piece of folk etymology and illustrates the obscurity as to the meaning of the name at the time of composition of the book. In Babylonian there is a word *puru*, one meaning of which seems to have been "a round stone," and then "lot," from the use of stones in divination. Possibly the Jewish author of the Book of Esther, living in Persia or Babylonia, had this word in mind, but it does not necessarily follow that *pūrīm* is identical with *puru*.

As celebrated by Orthodox Jews, the Purim festival is a time of feasting and merrymaking. It begins as soon as the stars appear on the evening of the fourteenth of Adar. Among some of the Levantine Jews the custom still prevails of whitewashing the tombs and bringing offerings of flowers at the Purim festival; and this has been interpreted by some scholars as a survival from the time when the festival was connected with the ancestral cult.

Bibliography. P. de Lagarde, *Purim, ein Beitrag zur Geschichte der Religion* (Göttingen, 1887); Wilhelm Erbt, *Die Purimsage in der Bibel* (Berlin, 1900); Paul Haupt, "Purim," in *Beiträge zur Assyriologie* (Leipzig, 1906); id., "Critical Notes on Esther," in *American Journal of Semitic Languages and Literatures* (Chicago, 1908); L. B. Paton, *Critical and Exegetical Commentary on the Book of Esther* (New York, 1908); Cosquin, in *Revue Biblique Internationale* (Paris, 1909); J. G. Frazer, *Golden Bough: A Study in Magic and Religion*, part iii (3d ed., London, 1911).

PURINE, pū′rĭn (from Lat. *pus, puris,* pus). A group of chemical combinations containing the purine nucleus C_5N_4, better called purine bases or bodies. The hydrogen compound of the nucleus C_5N_4 is called purine proper ($C_5N_4H_4$). We have three classes of purine bases, (1) oxypurines, which are supposed to represent end products of the breaking up of the nucleins of the muscles; (2) aminopurines, and (3) methylpurines.

PU′RITAN, THE. A yacht which defended the America's cup in 1885. See YACHTING.

PURITANI, I, ē pōō′rẽ-tä′ne (It., The Puritans). An opera by Bellini (q.v.), first produced in Paris, Jan. 25, 1835; in the United States, Feb. 3, 1844 (New York).

PU′RITANS (from Lat. *puritas,* purity, from *purus,* pure). A party title, originally a nickname which came into use about 1564, to designate that section of the Church of England which desired a more thorough reformation of the church than was effected under Elizabeth, as such reformation was understood by continental Protestantism, especially of the Calvinistic school. From the beginning of the Reformation age there had been three parties in the Church of England: a Romanizing element which desired to continue the connection with the Pope, whom it regarded as the vicar of Christ; a Protestant party, which desired the full modification of the Church of England, at least in doctrine, into conformity with continental Protestantism; and an intermediate party that, for want of a better designation, may be called Anglican, which wished to see all foreign ecclesiastical authority rejected, disliked monasticism, and welcomed the use of English in the services of the church, but did not desire such thoroughgoing modification of its doctrine or organization as the Protestant section sought. This Anglican party looked to the sovereign as the source of ecclesiastical government and was that which was represented by Henry VIII and Elizabeth. To the thinking of these energetic monarchs the desirable system of Church government for England was one in which the ruler should be supreme in ecclesiastical no less than in civil affairs. At the beginning of the reign of Queen Elizabeth a minority only of the population was heartily in sympathy with the Reformation. The great bulk of the clergy had been swept almost without question from the Roman obedience of Queen Mary's time into Elizabeth's Establishment; and the Queen's political policy, no less than her personal preferences, counseled her to make the ecclesiastical transition as easy as possible by retaining not a little of the ceremonies and vestments of the older worship and by insisting upon uniformity of ceremonial without very strenuous investigation into the belief or even the conduct of the ministry.

This compromise policy, however, was distasteful to the thoroughly Protestant party in the Church of England. Yet at first few of the Puritan leaders desired anything more than the disuse of the vestments, which seemed to them to symbolize too great a distinction between clergy and laity, and the abandonment of certain ceremonies which appeared to them to countenance what they deemed Roman sacramental misconceptions. Strongly conscious of the spiritual needs of England, they desired, furthermore, the establishment everywhere of an earnest preaching ministry and of vigorous discipline. These aims conflicted, however, with the Queen's policy of inclusion, and she set herself vigorously to enforce conformity in ceremony by the aid of the Bishops, who under the Elizabethan policy were regarded primarily as royal agents.

The result of this policy was a further evolution in Puritanism itself. While a great portion of the Puritans continued to represent the desires of the earlier period of the party which have just been described, a considerable section now went further and questioned the rightfulness of that form of Church government "by law established" which prevented the reforms they wished. The typical leader of this second stage of Puritanism was Thomas Cartwright (1535–1603). In his opinion the only biblical system of Church government was one essentially Presbyterian; and while he was willing to tolerate the existence of an extremely modified episcopacy, he would introduce into each parish the disciplinary and elective features of Presbyterian government. From thence onward until the Restoration, a large portion of the Puritan party walked in Cartwright's footsteps and sought the modification of the Church of England essentially along Presbyterian lines. In 1567 a congregation of Puritans met for private worship without the obnoxious vestments and ritual prescribed by the Queen through Parker and the other Bishops, but their leaders were soon imprisoned. A small wing of extreme Puritanism went yet further and under the leadership of Robert Browne, Henry Barrow (qq.v.), and others, insisted that the only proper organization of the church was in separate self-governing congregations, and that it was the duty of Christian men to leave the Church of England and establish such congregations; hence this extreme radical wing of Puritanism was known as the Separatists. These Separatists were vigorously opposed by the more moderate Puritans of Queen Elizabeth's time; but their spiritual sympathizers were to be the founders of Plymouth in New England, and their conception of Church government was ultimately to dominate the Puritan settlers of Massachusetts and Connecticut.

Throughout the reign of Elizabeth the repressive policy of the government continued, but the Puritan party grew and on the death of the Queen, in 1603, entertained strong hopes of favor from the new sovereign, James I. These hopes were disappointed, notably at the Hampton Court Conference (q.v.) in 1604. The Puritan party, however, continued to gain adherents throughout James's reign and that of his son Charles I. Under the latter repeated clashes occurred between the Puritans and the Anglican court party; and when the Civil War broke out in 1642 as a result of the many points of difference between Charles and the Parliament, the Puritans identified themselves strongly with the latter, while the Anglicans cast in their lot with the former. In the struggle that followed the Presbyterian wing of Puritanism was at first dominant, especially when reënforced by the military and political aid of the Scotch. Episcopacy was done away with so far as an act of Parliament could abolish it. The acceptance of the Solemn League and Covenant bound the English Parliament to practical Presbyterianism, and Parliament responded to the desire for a modification of the Church of England, always characteristic of Puritanism, by calling an Assembly of Divines, which met at Westminster from July, 1643, onward, to recommend alterations in doctrine and Church government. (See CREEDS AND CONFESSIONS.) The result of its sessions was the preparation of an essentially Presbyterian Directory for Worship and form of discipline, of a Confession of Faith, and of two Catechisms. This Westminster Confession was accepted by the General Assembly of the Church of Scotland in 1647 as its doctrinal standard, and approved, with some modifications, though not completely given the sanction of law, by the English Parliament in 1648.

But while the Westminster Assembly had been doing this work, the influence of anti-Presbyterian types of opposition to episcopacy had been growing in the army. The Presbyterian majority in Parliament and in the Westminster Assembly were as strongly insistent on uniformity and as opposed to toleration as the Anglican party had been. But the more radical religious thinkers represented in the army, who were grouped together under the general name of Independents, demanded by their very variety of opinion a certain measure of toleration, and the course of the struggle made the army the dominant force, for the time being, in English political life. The result was that the Presbyterian system was never fully established in England and the Westminster Confession of Faith never obtained more than a limited recognition there. The forces of Puritanism were divided, and Presbyterian Puritanism found it impossible to establish the principles which it desired to make controlling. Under the protectorship of Cromwell to his death, in 1658, the army's principle of partial toleration was dominant. His death left no efficient successor, and the restoration of the monarchy and with it Anglicanism was inevitable. Attempts were made at adjustment by which the Presbyterian wing of Puritanism, at least, might be included in the Establishment, and men like Richard Baxter labored to this end, but without success. Puritanism, instead of being a party within the Church of England as it had thus far been, was driven outside that church and made to assume the attitude of Dissent, to the great spiritual loss of the English Establishment. The triumphant Anglican faction adopted a rigorously persecuting policy towards Puritanism. Under the Act of Uniformity (q.v.) all Puritans who would not wholly accept the Prayer Book were driven from their livings. Episcopal ordination was now made obligatory; and by the Conventicle Act of 1664 any assembly of five or more persons not of the same family, for worship, was forbidden, save in conformity with the Church of England. The Five-Mile Act of 1665 forbade all in holy orders who would not take oath never to attempt any alteration in the government of church or state to continue to live within 5 miles of where they had exercised their ministry or of any English borough.

James II modified this repressive policy by issuing a Declaration of Indulgence in 1687; but a permanent legal status was not acquired by Puritan Dissent until after the revolution which put William and Mary on the throne. The Toleration Act of 1689 gave to the evangelical dissenting bodies a permanent and recognized, if limited, freedom of worship and an established legal position. At the time of the Toleration Act about two-thirds of the Puritan Dissenters appear to have been Presbyterian in polity and one-third Congregational or Baptist. During the course of the eighteenth century the Presbyterian wing of Puritanism became largely affected by Arian and Unitarian opinions, while the Congregational section was not so influenced to any marked extent. By the beginning of the nineteenth century the Congregational wing was the largest, and the spiritual life of Puritanism had been greatly reënforced by the effect of the Wesleyan movement. Its later history may be traced in the story of the religious bodies known as Presbyterian, Congregational, and Baptist.

Outside of England, the chief effect of the Puritan movement is to be seen in the planting of New England and the development of its characteristic religious faith and ecclesiastical polity. See CONGREGATIONALISM.

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1913); J. B. Tatham, *The Puritans in Power: A Study in the History of the English Church from 1640–1660* (New York, 1913); A. P. Newton, *Colonizing Activities of the English Puritans* (New Haven, 1914); also general histories of the Reformation in England.

PURKINJE, pụr′kĭn-yĕ, Johannes Evangelista, Knight von (1787–1869). An Austrian physiologist, born at Libochowitz, near Leitmeritz, Bohemia. At 18 he entered the Order of Piarists, with whom he served as a teacher, but he left after three years, before taking orders. He then studied medicine at the University of Prague (M.D., 1819), becoming assistant there and returning, after 26 years (1823–49) at Breslau, to fill the chair of physiology. While in Breslau he arranged a physiological laboratory in his own house (1824), thus becoming the founder of laboratory training in German universities. Purkinje was the leading physiologist of his time, his observations and discoveries in the field of ophthalmology, embryology, and histology being of the greatest importance. His dissertation *Beiträge zur Kenntniss des Sehens in subjectiver Hinsicht* (1819) was a notable work, and brought him the friendship of Goethe. Ophthalmology he followed up for the next four years, making valuable discoveries of subjective visual figures, recurrent images, etc. In 1823, 70 years before Sir Francis Galton, he pointed out the importance of finger prints in *De Examine Physiologico Organi Visus et Systematis Cutanei.* In 1825 he described the germinal vesicle in the egg, *Symbolæ ad Ovi Avium Historiam ante Incubationem;* in 1833 he discovered the sudoriferous glands of the skin with their excretory ducts (in Wendt's dissertation *De Epidermide Humana*); and in 1835 ciliary epithelial motion, *De Phænomeno Generali . . . Motus Vibratorii,* etc., with G. Valentin. He found (in 1837) the pear-shaped ganglionic cells in the cerebellum (the so-called Purkinje cells), the lumen of the axis cylinder in the nerves, and the ganglionic bodies in the brain. Two years before Schwann pointed out the identity of the structure in animal and vegetable cells Purkinje discussed the cellular theory (1837); in the same year and in 1838 he wrote of artificial digestion in *Magendrüsen und die Natur des Verdauens im Magen* and in *Ueber künstliche Verdauung.* In 1839 he described the Purkinje fibres in the muscles of the uterus (W. Kasper's dissertation *De Structura Fibrosa Uteri Nongravidi*), and in 1840 those in the muscles of the heart (B. Palicki's dissertation *De Musculari Cordis Structura*). The first to use the microtome, Canada balsam, and glacial acetic acid in microscopical examinations, he also introduced the use of 5 per cent salt solutions in lacerated wounds to prevent gangrene. It was Purkinje, too, who proposed the word "protoplasma" for the groundwork of cells. Besides the essays noted and many others, he wrote *Beobachtungen und Versuche zur Physiologie der Sinne* (1823–26).

PURPLE. A color between crimson and violet. Painters in oil and water colors produce the different shades of purple by the admixture of red and blue. From a very early period purple has been one of the most highly prized of all colors and came to be the symbol of Imperial and royal power. Probably one great reason for this was the enormous cost of the only purple color known to the ancients, the Tyrian purple, which is properly a deep crimson. It was obtained in minute quantities only from a Mediterranean species of molluscous animal or shellfish, the *Murex trunculus,* and perhaps also *Purpura lapillus.* (See Murex; Purple Shell.) During the Byzantine epoch purple became anew the symbol of the Imperial family; thus, the Imperial decrees were written in ink of this color. The costumes of the cardinals are reminiscent of this custom. Later it was manufactured from a lichen called the orchella in Italy, which supplied the rest of Europe with the prepared dye called orchil or archil (q.v.). The color was very fugitive and soon ceased to be used by itself; it, however, was found very useful in combination and has a remarkable power of brightening up other colors. Many improvements have been made in archil dyeing, especially in fixing it. Its value, however, has been greatly lessened by the discovery of the beautiful series of purples yielded by coal tar. Consult Alexander Dedekind, *Ein Beitrag zur Purpurkunde* (Berlin, 1898), and Karl Faymonville, *Die Purpurfärberei des klassischen Altertums* (Heidelberg, 1900).

PURPLE, Roman. See Murexide.

PURPLE COPPER ORE. See Bornite.

PURPLE-FACED MONKEY. A Ceylonese langur. See Langur; Wanderoo.

PURPLE FINCH. A beautiful crimson-tinted finch of the eastern United States and Canada. See Finch, and Plate of Familiar Sparrows, with the article Sparrow.

PURPLE GRACKLE, HERON, MARTIN, etc. See Grackle; Heron; etc.

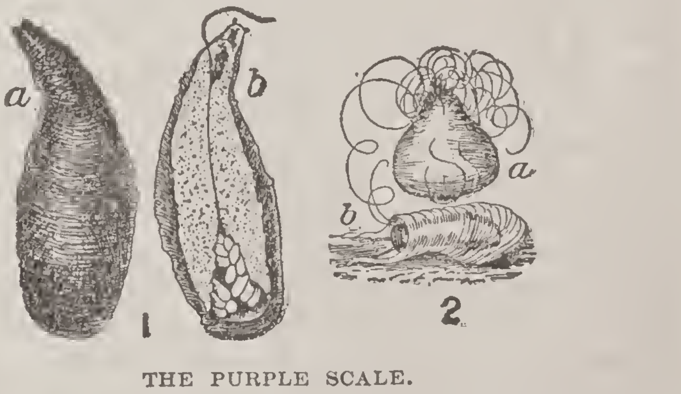
PURPLE HEART. See Purple Wood.

PURPLE ISLAND, The. A long poem by Phineas Fletcher (1633), describing the human body allegorically as an island of which the bones are foundations; arteries, rivers; heart and organs, cities; intellect, the king, attacked by diseases and vices.

PURPLE OF CASSIUS. See Cassius, Purple of; Gold.

PURPLES. A nematode disease of wheat. See Earcockles.

PURPLE SCALE. A name originating in Florida for *Mytilaspis citricola,* a scale insect which occurs exclusively upon citrus plants and swarms in the orange and lemon orchards of the southern United States, frequently causing great damage. It was introduced at one or two places in California about 1896 and is even more injurious in that State than in Florida when special efforts are not made to reduce its numbers. The species is probably of Chinese origin and has now spread to most parts of the world where oranges and lemons are grown. It occurs upon the twigs and branches, but has a strong tendency to overrun the leaves and the fruit. It is apt to infest the lemon, citron, and those varieties of orange which have large oil cells in the



THE PURPLE SCALE.

1, mature scale: *a*, upper surface; *b*, under surface, showing eggs. 2, a scale in formation: *a*, top view; *b*, side view.

skin of the fruit, such as the tangerine. The remedy most in use in Florida is the kerosene emulsion spray.

PURPLE SHELL. A gastropod mollusk of the genera *Murex* and *Purpura*, whose secretions give a purple stain. Certain other mollusks, as *Janthina* and *Aplysia*, yield a violet-hued liquor, while others, as *Arca*, pour forth red blood. The discovery and use of this color are prehistoric, and myths have arisen to explain them. Long before the beginning of the Christian era the gathering of the mollusks and application of the dye were practiced in factories all about the eastern part of the Mediterranean, several species of small *Murex* serving the purpose—principally *Murex trunculus.* The most famous place of production was near Tyre, whence the product came to be called Tyrian purple. It was limited in supply and costly and from an early time was reserved wholly for the use of royalty in church and state. Accounts of the various tints are given by Pliny (*Natural History*, vol. ii, book ix) and by others. The most highly esteemed Tyrian hue was a deep blood color, but full violet, heliotrope, and intermediate shades were made by blending. Tarentum, in southern Italy, also produced a famous red, and great heaps of broken shells in that neighborhood remained in 1789 to attest the importance of this ancient industry. The process was one of crushing the shell and macerating the animal. The juices were at first nearly colorless, but on exposure to the sunlight and proper treatment the rich purple hue was developed.

Of the mollusks other than *Murex* which yield the dye, the most important is the nearly related *Purpura*, especially the dog whelk (*Purpura lapillus*), a shell the size of an almond or smaller, which abounds on both coasts of the North Atlantic and which has been used from early times both in Great Britain and in New England as a source of an indelible violet ink for marking, ornamenting, and even dyeing textile fabrics. The color appears to be confined to a "vein" or gland near the head, which yields a drop of viscid liquid, which, when first dropped upon the cloth, or used with a pen to draw letters or an ornamental design, is colorless, but, as soon as it is exposed to the sun, changes rapidly from light to deep green, to blue, and at last to a fine purplish red. "'If the cloth be now washed with scalding water and soap and laid again in the sun, the color changes to a beautiful crimson," which is permanent. This dye was extensively used in Ireland in the fifteenth century for ornamenting women's gowns in drawn designs. Consult M. S. Lovell, *Edible Mollusca of Great Britain* (2d ed., London, 1884), and general works on conchology and antiquities.

PURPLE WOOD, or Purpleheart. The plum-colored heartwood of *Copaifera pubiflora* and *Copaifera bracteata*, of the family Leguminosæ, natives of British Guiana, where it is generally called Mariwayana. It is said that no other wood was so satisfactory for use in gun carriages and mortar beds, since it withstands violent concussions remarkably well.

PUR′PURA (Lat., from Gk. πορφύρα, *porphyra*, purple fish, purple dye). The term applied to a diseased condition in which a number of hemorrhages occur under the skin, so as to produce blotches of a more or less purple color. These spots vary from 1 to 4 millimeters in diameter. When small they are termed petechiæ; when large they are known as ecchymoses. At first bright red in color, they become darker and gradually fade to brownish stains. They do not fade on pressure. Purpura occurs as a secondary symptom in a large number of diseases, among them being scurvy, rheumatism, scarlatina, measles, smallpox, typhus fever, epidemic cerebrospinal meningitis, the plague, leucocythæmia, Hodgkin's disease, cirrhosis of the liver, and Bright's disease. It is dependent on an altered state of the blood or blood vessels. Purpura may follow the use of certain drugs, and snake poison produces a rapid extravasation of blood. As a distinct disease purpura occurs mainly in two forms, the simple and the hemorrhagic; these, however, may be regarded as essentially the same, but of different degrees of severity. A third variety, *peliosis rheumatica*, is also described. In its mildest form purpura appears simply as an eruption of purplish spots on the legs alone or scattered over the body and attended with little constitutional disturbance. Recovery usually takes place in from 10 to 20 days. In the hemorrhagic form the spots are larger and more numerous and bleeding occurs from the mucous membranes. The nose, mouth, stomach and intestines, kidneys, female generative organs, and the bronchi may be the sources of blood. Severe anæmia ensues, and great prostration is succeeded by death. There is often a rise in temperature. This type is usually met with in young and delicate persons, particularly girls. The treatment of the mild form is simply rest in bed, tonic medicines, and simple food. In severe cases efforts are made to stop the hemorrhage by the administration of drugs which have the power of contracting the blood vessels, notably ergot and suprarenal extract.

PURPURA LAPILLUS.

PURPURA. A genus of gastropod mollusks, represented by *Purpura lapillus*, a common snail living between tide marks on rocky shores of both coasts of the North Atlantic. It is carnivorous and is supposed to destroy young barnacles. Other species of *Purpura* inhabit the southern coasts.

PUR′PURATE AMMO′NIUM AND HYDROGEN. See Murexide.

PURPURATE OF AMMONIA. See Murexide.

PUR′PURE. The name for purple, one of the tinctures in heraldry (q.v.), represented in engraving by diagonal lines drawn athwart from the sinister.

PUR′PURIN (from Lat. *purpura*, purple) and Anthrapurpurin. Two isomeric organic coloring substances similar to alizarin and obtained along with it from madder root. They are formed also in the artificial production of alizarin (q.v.).

PURREE, pŭr′ē. See Indian Yellow.

PURSCH, or **PURSH,** Frederick Traugott (1774–1820). A German-American botanist, born in Grossenhain, Germany, and educated at Dresden. He emigrated to the United States in 1799 and occupied himself with botanical researches until 1811, when he went to England and there published his *Flora Americæ Septentrionalis* (2 vols., 1814), the most valuable work on the subject that had yet appeared. The following year he issued *Hortus Orloviensis*, and he died in Montreal while preparing a work upon the flora of Canada.

PURSE CRAB, or Robber Crab. Names for the great East Indian coconut crab (q.v.).

PURS′ER. See Paymaster.

PURSER, Louis Claude (1854–). A British classical scholar, born at Dungarvan, County Waterford, Ireland. He was educated at Middleton College, Cork, and at Trinity College, Dublin, where he was tutor (1881–98), professor of Latin (1898–1904), and junior bursar (after 1904). His publications include, besides articles in periodicals (especially *Hermathena*): a complete annotated edition (with W. Y. Tyrrell) of Cicero's *Correspondence*, a very important work, in seven volumes (1879–1900); the text of Cicero's *Epistles* in the "Oxford Classical Text Series"; an annotated edition of *The story of Cupid and Psyche* as related by Apuleius (1910).

PURS′LANE (OF. *porcelaine, pourcelaine*, from Lat. *porcilaca, portulaca*, purslane), *Portulaca*. A genus of plants of the family Portulacaceæ, the best-known species of which is common purslane (*Portulaca oleracea*), which grows as a weed in cultivated and waste grounds in almost all warm parts of the world and is sometimes cultivated as a potherb. It is a short-lived annual; with spreading and rather procumbent stems and obovate fleshy leaves, which, like the young shoots, are used in salads. The young and tender shoots are pickled in France like gherkins.

COMMON PURSLANE.

PURSUIVANT, pûr′swė-vant (OF., Fr. *poursuivant*, follower, from *poursuivre*, to follow, from Lat. *prosequi*, to follow, from *pro*, before + *sequi*, to follow; connected with Gk. ἕπεσθαι, *hepesthai*, Skt. *sac*, to follow, and ultimately with Eng. *see*). The third and lowest order of heraldic offices. The office was instituted as a novitiate, or state of probation through which the offices of herald and king at arms were in the ordinary course to be attained. See Herald; Heraldry.

PURSY MINNOW. A minnow of the typical genus *Cyprinodon*, especially *Cyprinodon variegatus*, a chubby little fish, of which the male measures 3 inches and the female 2 inches, and which abounds in all the brackish waters of the Atlantic coast south of Cape Cod. It is one of the most brightly colored of the minnows, and may be distinguished by the lustrous steel blue of the head and forward part of the back (but this fades immediately after death), the dusky bar at the tip of the tail, and the coppery tint of the abdomen. See Plate of Killifishes.

PURUÁNDIRO, po͞o′ro͞o-än′dē-rō. A town of the State of Michoacán, Mexico, 43 miles northwest of the city of Morelia. It is the centre of an important local trade and has leather manufactures. Pop., 1910, 8899.

PURU-PURUS, po͞o-ro͞o′-po͞o-ro͞os′. A tribe which formerly lived along the middle Purus, a southern affluent of the Amazon, in western Brazil, and apparently constituted, with one or two other tribes of the same neighborhood, a distinct linguistic stock which Brinton calls the Arauan. The name refers to a peculiar skin disease with which they were nearly all afflicted and which was manifested by white and brown blotches. They were savages of the lowest order, both sexes going perfectly naked. They were described by Spix and Martius in 1820 and by Castelnau and Wallace in 1847 and 1853, but the name is now extinct and the tribe seems to be represented by the modern *Pammari* or *Pammary*, i.e., eaters of the *pama* berry, who live in the same region. Consult K. F. P. von Martius, *Beiträge zur Ethnographie und Sprachenkunde*, vol. i (Leipzig, 1867), and D. G. Brinton, *The American Race* (New York, 1891).

PURŪRAVAS, po͞o-ro͞o′rȧ-vȧs. A legendary king of ancient India, renowned for his kingly virtues and personal beauty, and still more famous on account of his love for the Apsaras, or celestial hetæra Urvaśī. Their love was sealed on condition that he would never suffer two rams, which she always kept near her bedside, to be carried from her and that she should never see him naked. The Gandharvas, choristers in Indra's heaven, and lovers of the Apsarases, being jealous of Purūravas, stole the rams during the night. At this Purūravas was enraged and, trusting that Urvaśī would not see him, as it was dark, rose in pursuit of the robbers. At that moment, however, the Gandharvas caused a flash of lightning to irradiate the scene and Urvaśī beheld the King. The compact was violated and Urvaśī disappeared. Purūravas could find her nowhere. Like one insane, he wandered over the world until he saw her in the form of an aquatic bird at Kurukshetra, sporting with four other Apsarases in a lotus pool. Urvaśī, however, forbade him to approach until, at the end of the year, she should be delivered of the son with whom she was pregnant by him; but after the child's birth she visited the King once each year. Urvaśī succeeded in propitiating the Gandharvas who had caused the separation, and eventually she and the King were enabled to pass to the sphere where Gandharvas and Apsarases dwell together. This legend is as old as the Rig-Veda. It forms the subject of the celebrated drama of Kalidasa, the Vikramorvaśī, where, however, Urvaśī's disappearance is ascribed to a fit of jealousy, during which she trespassed on the proscribed bonds of a divine hermitage. This legend is very important not only as the oldest Indo-European love story, but especially because of the long history it has enjoyed in the literature of India. Consult: K. F. Geldner, *Vedische Studien*, vol. i (Stuttgart, 1889); A. A. Macdonell, *Vedic Mythology* (Strassburg, 1897); Maurice Bloomfield, "The Myth of Purūravas, Urvaçī, and Ayu," in *Journal of the American Oriental Society*, vol. xx (New Haven, 1899).

PURÚS, po͞o-ro͞os′. A large tributary of the Amazon. It rises on the Montaña of east Peru, flows in a general northeasterly direction through the Acre Territory and the State of Amazonas, Brazil, and empties into the Amazon through a large delta about 150 miles above the mouth of the Río Negro (Map: Brazil, D 5). It is a sluggish and much winding stream, flowing in its course of 1850 miles through the great forest plains. It is entirely unobstructed, and navigable for boats almost to its source; steamers ascend it 800 miles, and it has several large navigable tributaries. There are hardly any settlements along its banks, except a few stations for rubber gatherers. The river was first explored to its source in 1864 by the English traveler Chandless.

PURUSHA, pụr′ụ-shȧ (Skt. *puruṣa*, man). In Hindu philosophy, the efficient cause of the universe as contrasted with its material cause, Prakriti (q.v.). The term is also applied to the supreme god Brahma (q.v.). Consult L. D. Barnett, *Antiquities of India* (London, 1913), and A. A. Macdonell, *History of Sanscrit Literature* (ib., 1913).

PURVES, pûr′vĕs, George Tybout (1852–1901). An American Presbyterian clergyman, born in Philadelphia, Pa. He graduated at the University of Pennsylvania in 1872 and at Princeton Theological Seminary in 1876 and held his first pastorate in Wayne, Pa., from 1877 until 1880. He was in charge of churches in Baltimore and Pittsburgh until 1892, when he was appointed professor of New Testament literature and exegesis in Princeton Theological Seminary. In 1900 he became pastor of the Fifth Avenue Presbyterian Church in New York City, of which he was in charge at the time of his death. Dr. Purves was a preacher of unusual force and effectiveness. His publications include *Testimony of Justin Martyr to Early Christianity* (1889) and *Faith and Life* (1902), sermons.

PUR′VEY, John (c.1353–c.1428). An English Wiclifite. He was born probably at Lathbury, Buckinghamshire. For some years he was Wiclif's parochial chaplain at Lutterworth. In 1387 he was forbidden to itinerate in the diocese of Worcester, and in 1390 he was imprisoned for being a Wiclifite. Rather than suffer martyrdom he recanted in 1401. He was given the vicarage of West Hythe, Kent, but resigned in two years. Purvey, helped by other disciples of Wiclif, set about reducing to idomatic English Wiclif's (q.v.) version of the Bible. The new translation was completed about 1388. In his *Ecclesiæ Regimen* Purvey assailed the corruptions of the Church. Consult *The Holy Bible in the Earliest English Versions*, edited by Forshall and Madden (4 vols., Oxford, 1850).

PURVEY′ANCE, Royal. In English law, the former right or prerogative of the crown to demand supplies and services at the lowest price, to be fixed by appraisers, usually those chosen by the royal purveyors, or officers employed in procuring the royal supplies. This was one of the oldest of the royal prerogatives and gave rise to endless abuses and complaints until it was finally abolished by act of Parliament in the period of the Commonwealth (12 Car. II. c. 24). Those upon whom the purveyors made a demand had no choice but to sell their goods or services, and usually received their inadequate pay in treasury warrants, known as tallies, which entitled the recipients to deduct the amount from future taxes. Consult Henry Hallam, *Constitutional History of England* (London, 1827; new ed., New York, 1897), and Sir William Stubbs, *Constitutional History of England* (6th ed., Oxford, 1897).

PUS (Lat., white viscous matter from a sore). A characteristic product of inflammation. It occurs as a thick, yellow, creamy fluid, differing from all other morbid exudations in containing a large number of corpuscles, having a soft and fatty feeling when rubbed between the fingers, a peculiar odor, a salty taste, an alkaline reaction, and a specific gravity of about 1.032. Like the blood, it consists of certain definite microscopic elements and of an intercellular fluid or serum (the liquor puris) in which they swim. The microscopic elements are: (1) Pus corpuscles. Some of these are globular and slightly granular; others contain two or three nuclei, which are rendered more distinct by the addition of acetic acid. These are leucocytes and proliferated tissue cells which have died and degenerated. Living corpuscles, indistinguishable from leucocytes and exhibiting amœboid movements, are also present in proportions varying with the duration of the inflammation. (2) Granular débris, derived from rapid tissue necrosis and found in the pus from acute abscesses. (3) Various species of microorganisms, usually cocci. Decomposing pus abounds in putrefactive bacteria. Liquor puris is a straw-colored, clear fluid, which on being heated coagulates into a thick, white mass. It does not undergo spontaneous coagulation, differing in this respect from ordinary serum. This is described as normal, healthy, or "laudable" pus, according to the older surgeons. There are several varieties, such as (*a*) sanious pus, which is mixed with blood and is characteristic of caries and cancer; (*b*) malignant or ichorous pus, a thin, watery, acrid, and irritating fluid; (*c*) blue pus, which is seen in *Bacillus pyocyaneus* infections; (*d*) orange pus, so colored by hæmatoidin crystals, derived from the degeneration of red blood cells; (*e*) stinking pus, caused by the bacteria of putrefaction, or the colon bacillus; (*f*) fibrinous pus, which contains flakes of lymph; (*g*) serous pus, in which serum preponderates; and (*h*) mucopus, containing a large amount of mucus. The fluid derived from tuberculous degeneration (the so-called cold abscess) and that derived from syphilitic gummata are not considered true pus.

The chemical constituents of pus are water (varying from 769 to 907 in 1000 parts), albumen (from 44 to 180), fats (from 9 to 25), extractive matter (from 19 to 29), and inorganic salts (from 6 to 13); in addition to which, mucin, glycin, urea, etc., are occasionally present. Of the inorganic or mineral constituents, the soluble salts are to the insoluble in the ratio of 8 to 1 and the chloride of sodium (the chief of the soluble salts) is three times as abundant as in the serum of the blood. See Inflammation; Suppuration.

PUSAN, pōō-sän′. See Fusan.

PUSCHMANN, pụsh′mȧn, Theodor (1844–99). A German physician and historian of medicine. Born at Löwenberg in Silesia, he studied medicine at Berlin, Marburg, Munich, and Vienna (M.D. 1867). Afterward he traveled widely, practiced in Cairo, fought in the Franco-Prussian War, and finally settled in Munich. In 1878 he served as lecturer on the history of medicine at Leipzig, and thereafter was at Vienna as assistant professor and after 1888 as professor. His best-known work is *Geschichte des medizinischen Unterrichts von den ältesten Zeiten bis zur Gegenwart* (1889; Eng. trans. by Hare, *History of Medical Education*, 1891). Puschmann published the works of Alexander Trallianus in Greek text with German translation, also those of Philagrios and Philumenos, and wrote on the history of vaccination and of circumcision and on the general history of medicine. The *Handbuch der Geschichte der Medizin*, begun by him, was finished by Julius Pagel and Max Neuburger (qq.v.) and published in 1903–05. Puschmann's widow left $125,000 to found, in connection with the University of Leipzig, the Institut für die Geschichte der Medizin, which publishes *Studien zur Geschichte der Medizin.* See also SUDHOFF, KARL.

PUSEY, pū′zĭ, EDWARD BOUVERIE (1800–82). An English theologian, a leader in the Oxford movement. He was born at Pusey House, in Berkshire, Aug. 22, 1800, son of the Hon. Philip Bouverie, who changed his name to Pusey as a condition of his succession to the Pusey estate in 1789. He was educated at Eton and at Christ Church, Oxford, where he won high honors. In 1824 he was elected fellow of Oriel, where he became associated with Newman and Keble (qq.v.). About this time he spent two years in Germany, and his first published work was an admirable summary of the history of German theology since the Reformation. In the same year that it appeared, 1828, he was appointed to the regius professorship of Hebrew at Oxford, with the attached canonry of Christ Church, a post which he held until his death. His life, though profoundly influential, was singularly uneventful. Indeed, he lived in his books, mingling little in general society. His domestic life was saddened by successive losses of parents, brothers, wife, daughter, and son. Pusey will always be remembered for his connection with the Oxford movement. His sermon on the Rule of Faith in 1851 stemmed the tide of secessions to the Roman Catholic church after the Gorham judgment. (See GORHAM CONTROVERSY.) The revival of the practice of private confession in the English church dates from his two sermons on "The Entire Absolution of the Penitent" (1846). His teaching on the Real Presence in the Holy Communion became the accepted teaching of the Catholic school of the Church of England. He was the theologian of the new movement. His great learning, enforced as it was by the strictness and purity of his life, gave it its vitality. His suspension for preaching his celebrated sermon on the Eucharist in 1843, in which he stated views on the Real Presence opposed to the Protestant position, only enhanced his influence in the High Church party.

His power of sustained labor was remarkable and his painstaking diligence proverbial. Especially notable evidence of these traits is to be found in his work as editor in chief of the *Library of the Fathers.* His correspondence as a spiritual adviser alone was enormous, and he had a part in every important controversy in the Church of England from the time of the publication of his tract *On Baptism* in 1835 to 1879, when he and Farrar disputed the question of everlasting punishment.

At Oxford is the Memorial Pusey House, which holds his library and perpetuates his teaching. It is a small religious community. Besides several volumes of sermons Pusey's more important works were commentaries on Daniel (1864) and on the Minor Prophets (1860 et seq.); his discussions of the possibility of the reunion of Christendom, generally known by their subtitle of *Eirenicon,* in three parts (1865, 1869, 1870); and the eschatological treatise already alluded to, *What is of Faith as to Everlasting Punishment?* (1880). Consult an admirable biography begun by Canon Liddon and completed after his death by Johnston and Wilson (4 vols., London, 1893–96); C. C. Grafton, *Pusey and the Church Revival* (Milwaukee, 1902); Maria Trench, *Story of Dr. Pusey's Life* (New York, 1906); G. W. E. Russell, *Dr. Pusey* (London, 1907); Paul Thureau-Dangin, *English Catholic Revival in the Nineteenth Century* (2 vols., ib., 1914), and many of the works referred to under OXFORD MOVEMENT.

PUSHAN, po͞o′shȧn (Skt. *Pūṣan,* prosperer, from *puṣ,* to cause to thrive). A deity of Vedic India. He is frequently mentioned in the Vedas (q.v.). He beholds all creatures, and has his home in heaven, where he rides in a golden car drawn by goats. He furthermore conducts the souls of the dead to the Pitris (see PITRI), and is consequently a guardian of roads and, by implication, a discoverer of what is hidden. In his character he is beneficent, protecting not only men, but beasts, and is therefore a deity of wealth, while as a god of fertility he is invoked in the wedding ritual, being himself the lover of his mother or, according to other hymns, of his sister. He has a unique and somewhat grotesque quality in his toothlessness, in consequence of which his food is gruel. The data concerning him make reasonable the view that he is a pastoral deity representing the sun in its beneficent aspect. Consult: J. Muir, *Original Sanskrit Texts* (London, 1868–74); Perry, "Notes on the Vedic Deity Pūsan," in *Classical Studies in Honour of Henry Drisler* (New York, 1894); A. A. Macdonell, *Vedic Mythology* (Strassburg, 1897); L. D. Barnett, *Antiquities of India* (London, 1913).

PUSHKIN, pu̇sh′kĭn, ALEXANDER SERGEYEVITCH (1799–1837). The greatest poet of Russia. He was born at Moscow of a noble family, inheriting African blood from a maternal ancestor. His formal home-education, according to the fashion of the time, was exclusively French, his first knowledge of Russian being acquired from nursery tales, legends, and songs. The boy manifested no unusual precocity until he was nine years of age—indeed, he was rather backward—but then his extraordinary passion for reading began to develop. This, coupled with a photographic memory, made him as voracious and retentive a reader as Macaulay. In 1811 he entered the Imperial Lyceum at Tsarskoe Selo, where he soon attracted general attention by his outspoken criticism of men and things, his neglect of study, his bold epigrams, and his poetic endowments. His first published poem bears the date 1814, and at the public examination in 1815 he aroused the admiration of the veteran poet Derzhavin by his *Recollections of Tsarskoe Selo.* On graduating in 1817 Pushkin became a clerk in the Ministry of Foreign Affairs. He was already a well-known figure in Russian literature and was immediately admitted to membership in the literary society Arzamas, whose members included the shining lights of the day. His first important long poem, *Ruslan and Lyudmila* (1817–20), a bold combination of fancy and realism, attracted much attention. About this time, incurring the government's displeasure by his advanced political views and his avowed sympathies with the young Liberals, Pushkin was banished to southern Russia with General Inzov's colonizing bureau. The life in Bessarabia, the Crimea, the Caucasus, and Odessa meant much for Pushkin; the variety and gorgeousness of the natural scenery, life among new people, the influence of Byron, with whose works he then became acquainted—all these made an indelible impression on the young poet and determined, in large measure, the character of his subsequent work. Thus, under the stimulus of this new environment and the inspiration of the bold Byronic verse, he produced *The Caucasian Prisoner* (1822), *The Fountain of Bakhtchisarai* (1824), the first three cantos of *Yevgény Onêgin* (Eugene Onegin), a novel in verse, and *The Gypsies* (1827). In 1824 he was transferred to his mother's estate at Mikhailovskoé (Government of Pskov). The two years spent in this remote region of Russia were the most fruitful in the poet's life. Cantos four to six of *Yevgény Onêgin, The Brother Murderers*, and the drama *Boris Godunov* were written during this exile. Pushkin freely admitted his indebtedness to Shakespeare (who had already displaced Byron in Pushkin's admiration), Karamzin, and the Chronicles, but his *Boris Godunov* is entirely original in character. All the characters in it, as well as the masses and historical background, are thoroughly Russian and are drawn with a marvellous fidelity to the epoch. (See Godunov.) The story was used as the basis for an opera by Mussorgski (q.v.). In 1828 appeared Pushkin's *Poltava* (finished in less than a month and originally named *Mazepa*), depicting the struggle between Peter the Great and Charles XII and the treachery of Mazepa. In 1830 he produced the last two cantos of *Yevgény Onêgin*. Written during some nine years, this picture of society reflects various incidents of the poet's life during its composition.

In 1831 Pushkin was attached to the Foreign Ministry with a salary of 5000 rubles and commissioned to write a history of Peter the Great. In 1833 he received 20,000 rubles to print his *History of the Pugatchev Insurrection*. During this period his works were chiefly in prose. The novels *The Captain's Daughter* (1836) and *Dubrovsky* (1841) and the history are representative of Russian prose at its best. A year after the appearance of *The Captain's Daughter* the poet was killed in a duel (sought by himself) with D'Anthès, adopted son of the Dutch Ambassador, whose association with Madame Pushkin, innocent though it was proved to be, had caused much gossip.

Pushkin is the flowering of the best in Russian literature. He possessed an original intellect reënforced by a quick intuition. His humor was gentle and his wit keen; his epigrams are among the best ever produced in any language. He had an extraordinary mastery of the technique of his art. A monument to him was erected at Moscow in 1880, and the celebration of his centenary was one of the greatest events in Russian literary history.

Bibliography. The best among the numerous editions of his works is that published by the Russian Imperial Academy of Science (begun in 1899 and still (1915) uncompleted). English translations: *Poems*, by Ivan Panin (2d ed., Boston, 1888); *Prose Tales*, by T. Keane (New York, 1896); *Translations from Pushkin*, in memory of the one hundredth anniversary of the poet's birthday, by C. E. Turner (St. Petersburg, 1899); *Russian Romance*, by Mrs. J. B. Telfer (London, 1875). In German: *Gedichte*, two volumes, by Bodenstedt, in *Gesammelte Schriften*, vols. iv and v (1865–69); *Russische Lyrik in den Versmassen des Originals*, by Hans Gerschman (Königsberg, 1895); G. Eduard, *Aus russischen Dichtern* (*Puschkin und Lermontoff*) (Reval, 1898). There are also, of course, numerous translations of separate works. Consult: Jacques Flach, *Un grand poète russe* (Paris, 1894); Michael Pokrowskij, "Puschkin und Shakespeare," in *Deutsche Shakespeare Gesellschaft Jahrbuch*, vol. xliii (Berlin, 1907); Rosa Newmarch, *Poetry and Progress in Russia* (London, 1907); Alexander Brückner, *A Literary History of Russia*, translated by H. Havelock (ib., 1908).

PUSHTU, pŭsh′tŭ. See Afghan.

PUS′LEY. See Purslane.

PUSS IN BOOTS. The popular nursery tale of the clever cat which secures a fortune and a princess for his master, a young miller, who passes under the name of the Marquis of Carabas. The story was told by Perrault as "Le chat botté," in his *Contes des fées* (1697). He found it in Straparola's *Piacevole notte*, translated in 1585, in which the hero is called Constantine's Cat. A celebrated German version is Tieck's *Der gestiefelte Kater*.

PUSS MOTH. A name in England of *Cerura vinula*, a notodontid moth common throughout Europe and northern and western Asia. It expands from 2 to 2.5 inches; the fore wings are white suffused with gray and with dull dark-gray transverse lines; the thorax is spotted with black. The larva feeds on poplar and willow and discharges an acrid fluid from an opening in the throat. At the end of the body the caterpillar has a pair of tubes in which are concealed two long flexible whips which may be rapidly thrust out and withdrawn (see Plate of Butterflies and Moths, Fig. 14) and which are supposed to protect the larva from its natural enemies, as are also the terrifying attitudes which it assumes and the secretion which it ejects. When full grown it spins a solid and impervious cocoon.

PUS′TULE, Malignant. See Anthrax; Malignant Pustule.

PUTEAUX, pụ′tō′. A town in the Department of Seine, France, 6¼ miles west of the centre of Paris by rail (Map: Paris and Vicinity). It is situated northeast of and at the base of Mont Valérien, on the left bank of the Seine, opposite the Bois de Boulogne, with which it is connected by a bridge which crosses the Ile de Puteaux. It is a favorite residential suburb of Paris. It has dye and calico-printing works, manufactures of chemical products, and artillery works. Pop., 1901, 24,341; 1911, 32,223.

PUTE′OLI. See Pozzuoli.

PUTIGNANO, po͞o′tē-nyä′nō. A town in the Province of Bari, Italy, 23 miles southeast of Bari (Map: Italy, F 4). The chief industry is weaving, and there is trade in wine, oil, and fruit. Pop. (commune), 1901, 13,969; 1911, 13,997.

PUTLITZ, po͝ot′lĭts, Gustav Heinrich Gans, Knight zu (1821–90). A German dramatist and novelist, born at Retzin, Brandenburg. He studied law in Berlin and Heidelberg. From 1846 to 1848 he was a functionary in the Government of Magdeburg, and thereafter he lived partly on his estate at Retzin, partly in Berlin.

In 1863 he became director of the Court Theatre in Schwerin; from 1867 to 1868 he was court marshal of the Prussian Crown Prince, after which he devoted himself to literature, dwelling in Berlin. Between 1873 and 1889 he managed the Court Theatre in Karlsruhe.

Among his works are the poetic fairy stories *Was sich der Wald erzählt* (1850; 50th ed., 1900), *Walpurgis* (1869), and *Vergissmeinnicht* (1853); two plays, read in American schools, *Badekuren* and *Das Herz vergessen;* and the dramas *Das Testament des Grossen Kurfürsten* (1858), *Rolf Berndt* (1881), *Das Schwert des Damokles* (1878), and *Spielt nicht mit dem Feuer!* (1869). Consult *Gustav zu Putlitz: ein Lebensbild*, by his widow (Berlin, 1894–95); also the autobiographical *Mein Heim: Erinnerungen aus Kindheit und Jugend* (ib., 1885; 2d ed., 1886) and A. Stern in the *Grenzboten für Politik, Litteratur, und Kunst*, vol. i (Leipzig, 1896).

PUT′NAM. A city and one of the county seats of Windham Co., Conn., 34 miles north of Norwich, on the Quinebaug River and on the New York, New Haven, and Hartford Railroad (Map: Connecticut; H 2). It has a public library and the Day Kimball Hospital. The Cargill Falls in the vicinity are of scenic interest. Putnam is situated in an agricultural region, but is interested chiefly in ironworking and in the manufacture of cotton and woolen goods, silks, cutlery, trunks, steam heaters, boxes, boots and shoes. The government is vested in a mayor, elected biennially, and a unicameral council. Putnam, incorporated in 1855, obtained its present charter in 1895. Pop., 1900, 6667; 1910, 7280.

PUTNAM, Emily James (Smith) (1865–). An American author and educator, the daughter of Judge James C. Smith, of Canandaigua, N. Y., and wife of George Haven Putnam (q.v.). She was born in Canandaigua and was educated at Bryn Mawr College, where she took her A.B. degree in 1889, afterward spending a year at Girton College, Cambridge, England. From 1891 to 1893 a teacher of Greek at the Packer Collegiate Institute, Brooklyn, she left there to become a fellow in Greek at the University of Chicago (1893–94), and thereafter until 1900 she served as dean of Barnard College, Columbia University. In this college she later became associate in history. She married Mr. Putnam in 1899. From 1907 to 1911 Mrs. Putnam was vice president and manager of the Women's University Club (New York), and in 1901–04 she had held the presidency of the League for Political Education. Whatever came from her pen was finely done. Mrs. Putnam's *The Lady: Significant Phases of her History* (1910; 2d ed., 1913) the *North American Review* justly declared to be "the most brilliant book of essays ever written by an American woman." In addition to this volume and frequent contributions to reviews she published: *Selections from Lucian* (1891), a translation; *Greek Religion* (1913); and a second translation, that of Emile Faguet's *The Dread of Responsibility*, with an introduction (1914).

PUTNAM, Frederic Ward (1839–1915). An American anthropologist, born in Salem, Mass. In 1856 he was curator of ornithology in Essex Institute (Salem) and published a *List of the Birds of Essex County;* and in the same year he entered Lawrence Scientific School and took a special course under Louis Agassiz, to whom he was assistant until 1864. He was in charge of the Museum of Essex Institute from 1866 to 1873, and also superintendent of the East India Marine Society (1867–69) and director of the Peabody Academy of Sciences (1869–73). Putnam was an assistant in the Kentucky Geological Survey in 1874. From the latter year until 1909 he was curator of the Peabody Museum of Archæology and Ethnology of Harvard University, and from 1886 until his retirement in 1909 was Peabody professor of American archæology and ethnology. At the Chicago World's Fair he served as chief of the Department of Ethnology and in 1894–1903 was curator of anthropology in the American Museum of Natural History, New York. His extensive researches included explorations in Ohio, where he was instrumental in having the Great Serpent Mound preserved, and in New Jersey. He originated the *Naturalist's Directory* in 1865, was one of the founders of the *American Naturalist* in 1867, and in 1898 he was president of the American Association for the Advancement of Science. He was president of the American Folk-Lore Society in 1901, and of the American Anthropological Association in 1905, and became a member of the National Academy of Sciences and of many foreign learned societies.

PUTNAM, George Haven (1844–). An American publisher and author, son of George Palmer Putnam and brother of Herbert Putnam and of Mary Putnam Jacobi (qq.v.). Born in London, England, he was educated at the Columbia Grammar School, New York City, at the Sorbonne, Paris, and at the University of Göttingen. He returned from Germany to enlist in the 176th New York Volunteers as a private, and he rose to the rank of major in his regiment, having served through the Civil War and having been a prisoner both at Libby and at Danville, Va. The war over, he gave himself primarily to the business of the publishing house of which eventually he became the head, but he also gave much time to authorship and to civic affairs. In 1887 he led in organizing the American Copyright League and was the secretary of that body during its victorious fight for international copyright, which resulted in the Copyright Bill of 1891. Mr. Putnam's connection with this copyright agitation brought him the cross of the French Legion of Honor. In 1899 he married, as his second wife, the dean of Barnard College. (See Putnam, Emily James Smith.) His writings include: *Authors and Publishers* (1883); *The Question of Copyright* (1891); *Authors and their Public in Ancient Times* (1893); *Books and their Makers in the Middle Ages* (1896); *The Censorship of the Church of Rome and its Influence upon the Production and Distribution of Literature* (2 vols., 1907); *Abraham Lincoln* (1909); *A Prisoner of War in Virginia* (1912); *George Palmer Putnam: A Memoir* (1912); *Memories of my Youth* (1914); *Memories of a Publisher* (1915).

PUTNAM, George Palmer (1814–72). An American publisher, grandnephew of Gen. Israel Putnam. He was born in Brunswick, Me., Feb. 7, 1814. At 14 he entered the bookstore of D. and J. Leavitt, New York. In 1840 he became partner in the house of Wiley and Putnam, of which he established a London branch in 1841. In 1848 he returned to New York and founded the publishing house which later became the firm of G. P. Putnam's Sons. Bookmaking as an art interested him from the beginning. In 1853, with the aid of George William Curtis, he established *Putnam's Magazine* (discontinued in 1857; revived 1868–71 and again 1906–10). In 1861 he organized the Loyal Publication Society. In order to serve as United States collector of internal revenue, he suspended his business for three years (1863–66) and then refounded it in conjunction with his sons, George Haven (q.v.) and John Bishop. Another son was Herbert Putnam (q.v.). One daughter became noted as a physician (see JACOBI, MARY PUTNAM); another, Ruth Putnam, as an author. Notable among the latter's books are *William the Silent* (1894), *Charles the Bold* (1898), and *Alsace and Lorraine: From Cæsar to Kaiser* (1915). George Palmer Putnam was a founder of the Metropolitan Museum of Art, of which he was made honorary superintendent in 1872. He was also chairman of the committee on art at the Vienna Universal Exposition. He died in New York, Dec. 20, 1872. Putnam was the author, among other works, of: *Chronology, or an Introduction and Index to Universal History, Biography, and Useful Knowledge* (1833); *American Book Circular, with Notes and Statistics* (1843); *American Facts, Notes, and Statistics Relative to the Government of the United States* (1845); *The World's Progress: A Dictionary of Dates* (1850) and a supplement to this work (1861). Consult G. H. Putnam, *George Palmer Putnam: A Memoir* (New York, 1912), and id., *Memories of my Youth* (ib., 1914).

PUTNAM, HERBERT (1861–). An American librarian, brother of George Haven Putnam. He was born in New York City, graduated at Harvard in 1883, studied at the Columbia Law School in 1883–84, and in 1886 was admitted to the Minnesota bar. He was librarian of the Minneapolis Athenæum from 1884 to 1887 and of the Minneapolis Public Library from 1887 to 1891, practiced law in Boston from 1892 to 1895, and was librarian of the Boston Public Library from 1895 to 1899, when he became librarian of Congress. He was elected president of the American Library Association in 1898 and again in 1903. Besides writing frequently for the periodicals on subjects pertaining to his profession, he was a contributor to the NEW INTERNATIONAL ENCYCLOPÆDIA. Honorary degrees came to him from Bowdoin, Williams, Yale, Brown, and other institutions.

PUTNAM, ISRAEL (1718–90). An American soldier, prominent in the French and Indian and the Revolutionary wars. He was born in Old Salem Village (now Danvers), Mass., removed to Pomfret, Conn., in 1740, and became a farmer and wool grower there. In the winter of 1742–43, according to tradition, he gave evidence of unusual coolness and intrepidity by entering a cave alone and, by the light of a torch, shooting a wolf which had taken refuge there. In August, 1755, during the French and Indian War, he was commissioned lieutenant by the Connecticut Legislature, later in the year became one of Rogers's Rangers, in March, 1756, became captain, saved Fort Edward from being destroyed by fire in the winter of 1757, and in March, 1758, became major. In August, 1758, he was captured near the present Whitehall, N. Y., in an engagement with a force of French and Indians under the partisan leader Marin, but, after undergoing many hardships and narrowly escaping death, was exchanged, in November, through the influence of Col. Peter Schuyler, himself a prisoner. He served under Amherst in the Montreal expedition, went as acting colonel of the Connecticut regiment on the expedition to the West Indies, and participated in the attack on Morro Castle, Havana, July 30, 1762. In Pontiac's War he was a major of Connecticut troops under Bradstreet, sent to relieve Detroit. In 1765 he was an ardent opponent of the Stamp Act and closely identified himself with the radical Whigs, becoming one of the leaders of the Sons of Liberty in Connecticut and chairman of one of the committees of correspondence. In 1766 he was elected to the Connecticut Assembly. He opened a tavern at Brooklyn, Conn., in June, 1767. He was made a member of the so-called exploring committee of the Company of Military Adventurers organized by Gen. Phineas Lyman (q.v.) in 1772 and as such visited the Lower Mississippi valley and west Florida, where land grants had been promised to the company.

In 1774 he was among those who sent material assistance to the Bostonians, who, through the operations of the Port Bill and their attitude thereto, were put in immediate need of the necessaries of life. In April, 1775, tidings of the battle of Lexington reached him while he was plowing; he left his plow in the field, as had Cincinnatus, and, mounting his horse, rode to Cambridge in one day, a distance of 68 miles. Returning, he was made brigadier general by the Legislature, organized and drilled a regiment, and in a week was on his way back with his men to Cambridge. In May of that year he led a battalion to Noddle's Island, burned a British schooner, captured a sloop, and killed and wounded many of the enemy. By his advice it was decided to fortify Bunker Hill, in the engagement at which place he is considered by many to have been the commanding officer, though others claim this honor for Prescott. In this engagement Putnam displayed great energy and bravery, though he does not seem to have been present in the main redoubt on Breed's Hill, where Prescott commanded. On the arrival of Washington at the camp to take command in July, 1775, he brought commissions from Congress for four major generals, one of whom was Putnam. On the evacuation of Boston in the spring of 1776, Putnam was placed in command of New York. He held the chief command within the fortified lines during the battle of Long Island, was sent to Philadelphia to fortify that city in December, 1776, was afterward stationed at Crosswick and Princeton, and in May, 1777, was ordered to take command in the Highlands of the Hudson. In the summer of that year he was removed from his command in the Highlands on account of the surprise and loss of Forts Montgomery and Clinton, though he was acquitted of blame by a court of inquiry and restored to his command. In 1779, when stationed in Connecticut, Horseneck, one of his outposts, guarded by 150 men and two cannon, was attacked by the British officer Tryon, with 1500 men. Putnam, being closely pursued while on his way with his men to a swamp, is said to have dashed down a steep hill and escaped. Riding to Stamford and collecting the militia, he formed a junction with his troops, pursued Tryon in his retreat, and took 50 prisoners. In the summer of 1779 he had command of the troops in the Highlands and completed the fortifications at West Point. The army going into winter quarters, he returned home, and on starting out again for camp was stricken with paralysis, from which he never completely recovered. He died May 29, 1790, on his farm near Brooklyn, Conn. In this village is a monument to him by Karl Gerhardt, and especially notable is that by J. Q. A. Ward at Hartford. It was the grandnephew of Israel Putnam who founded the New York publishing house of G. P. Putnam's

Sons. (See the articles on G. P. Putnam and other notable descendants.) Consult: I. N. Tarbox, *Life of Israel Putnam* (Boston, 1876); W. F. Livingston, *Israel Putnam, Pioneer, Ranger, and Major-General* (New York, 1901), in "American Men of Energy Series"; F. A. Ober, *"Old Put," the Patriot* (ib., 1904).

PUTNAM, Mary Traill Spence (Lowell) (1810–98). An American poet, translator, and essayist, daughter of Rev. Charles Lowell and sister of James Russell Lowell and Robert T. S. Lowell. She was born in Boston and in 1832 married a merchant of that city, Samuel R. Putnam. Besides numerous contributions to magazines, especially on Polish and Hungarian literature and history, she wrote two metrical dramas on slavery, *A Tragedy of Errors* (1861) and *A Tragedy of Success* (1862); a novel, *The Record of an Obscure Man* (1861); *A History of the Constitution of Hungary*, made timely by the visit of Kossuth (1850); *Memoir of William Lowell Putnam*, her son, killed at Ball's Bluff (1862); *Fifteen Days: An Extract from Edward Colvil's Journal* (1866); *Memoir of Charles Lowell*, her father (1885); and a translation from the Swedish of Fredrika Bremer's *The Neighbors*.

PUTNAM, Rufus (1738–1824). An American soldier. He was born in Sutton, Mass., was a millwright's apprentice there from 1754 to 1757, enlisted as a private soldier for service in the French and Indian War in 1757, and became an orderly sergeant in 1759 and an ensign in 1760. While an apprentice he studied diligently during his leisure hours, gaining a fair knowledge of mathematics and history, and after 1760 devoted himself to the study of surveying, in which he soon became markedly proficient. He entered the continental army as lieutenant colonel in May, 1775, planned the defenses at Roxbury, and in August, 1776, was appointed chief engineer of the army with the rank of colonel. Preferring field service, however, he was placed in command of a Massachusetts regiment in November and in 1777 served with great gallantry in the campaign against Burgoyne. In 1779 he aided his cousin, Israel Putnam, in completing the West Point fortifications and in 1783 was made brigadier general. He was a member for several terms of the Massachusetts Legislature and during Shays's Rebellion was General Lincoln's aid. In 1786 he, with Gen. Benjamin Tupper, organized a company, composed of officers and soldiers of the Revolutionary War, to form a settlement in what is now Ohio. He was one of three directors appointed by this company (the Ohio Company) in 1787 to secure a tract of land from Congress, and, chiefly through his efforts, 1,500,000 acres were obtained at 66⅔ cents per acre. This tract was located at the junction of the Ohio and Muskingum rivers, whither in 1788 Putnam led the first party of settlers, laying out Marietta (q.v.), the first organized settlement in the Northwest Territory. He was one of the judges of the United States Court in the Northwest Territory from 1790 to 1796, concluded an important treaty with the Indians at Vincennes, Ind., in 1792, was Surveyor General of the United States from 1796 to 1803, and was a member of the Ohio Constitutional Convention in 1802. In 1812 he organized the first Bible society west of the Alleghanies. His manuscript diary, an interesting document, has been preserved. There is an autobiography, written in 1812 and also in manuscript, deposited in the college library, Marietta, Ohio. Consult: *Journal of General Rufus Putnam, 1757–60* (Albany, 1886); Sidney Crawford, "Rufus Putnam and his Pioneer Life in the North West," in *American Antiquarian Society, Proceedings*, vol. xii (Worcester, Mass., 1899); A. B. Hulbert, in *Pilots of the Republic* (Chicago, 1906). His autobiography, journal, and other papers have been reprinted in *The Memoirs of Rufus Putnam*, edited by Rowena Buell (Boston, 1903).

PUTNAM-JACOBI, Mary. See Jacobi, Mary Putnam-.

PU'TREFAC'TION. See Fermentation; Ptomaines.

PUTRID FEVER. See Typhus Fever.

PUTRID SEA. A lagoon on the coast of the Crimea. See Sivash.

PUTS AND CALLS. See Stock Exchange.

PUT'TENHAM, George (?–c.1590). The reputed author of a treatise entitled *The Arte of English Poesie, contrived into three bookes; the first of Poets and Poesie, the second of Proportion, the third of Ornament* (1589). The work has also been, with more likelihood, claimed for his elder brother, Richard Puttenheim (c.1520–c.1601). It was issued anonymously. The book is an early landmark in the history of English literary criticism. Consult the reprint by Edward Arber (London, 1869).

PÜTTER, pụt'tẽr, Johann Stephan (1725–1807). A German jurist, born at Iserlohn. He studied at Halle and Jena and after 1757 was professor of law at the University of Göttingen. He exerted great influence on the law institutions of his time, and some of his works, which are written with care and originality, are still valuable. His principal work is *Historische Entwicklung der heutigen Staatsverfassung des deutschen Reichs* (1786–99); and his other writings include *Elementa Juris Publici Germanici* (1754); *Primæ Lineæ Juris Privati Principum* (1768); *Literatur des deutschen Staatsrechts* (1776–91).

PUTTKAMER, pụt'kȧ-mẽr, Robert Viktor von (1828–1900). A Prussian statesman, born at Frankfort-on-the-Oder. He studied in 1846–50 at Heidelberg, Geneva, and Berlin, entered the government service in 1854, and became *Regierungspräsident* (president of an administrative district) at Gumbinnen in 1871 and at Metz in 1874. In 1873 he was elected to the Reichstag, where he was prominent as a strong Conservative, in 1877 became Chief President of the Province of Silesia, and in 1879 Minister of Education and Public Worship. He took measures against the undenominational schools, made concessions to the orthodox Evangelicals, and introduced a simplified form of German spelling. In 1881 he was appointed Minister of the Interior and vice president of the ministry. His conservative administration, and particularly the methods employed by him in favoring the election of government candidates, was attacked by the Radicals, notably in a speech by Eugen Richter, and disapproved by Frederick III upon the latter's accession. He therefore resigned (1888) and held no other office until his appointment as Chief President of Pomerania by William II in 1891. From this post he resigned in 1899.

PUTUMAYO, po͞o'to͞o-mä'yō. This name was applied to certain alleged atrocities in the Putumayo rubber district of Peru which were reported to the British government in 1911–12.

Sir Roger Casement was ordered to make a thorough investigation. His report confirmed the rumors of the selling of Indians into bondage and of brutal floggings when insufficient amounts of rubber were brought in by the native workers. The United States government declared itself ready to coöperate with Great Britain in securing reform. The Peruvian government promised reforms, but little was accomplished. After an investigation (July, 1912) by a United States agent, the Peruvian government protested against the attitude of Great Britain and the United States, but ordered a thorough investigation and punishment of the guilty. Thirty-two persons implicated were arrested and an efficient judicial and administrative system was installed in the district by President Billinghurst. See Ica.

PUT YOURSELF IN HIS PLACE. A novel by Charles Reade (1870).

PUVIS DE CHAVANNES, pụ′vē̇′ d*e* shȧ′vȧn′, Pierre (1824–98). The leading mural painter of the nineteenth century. Born at Lyons, Dec. 14, 1824, the son of an engineer, of a distinguished family of Burgundy, he took the classical course in a lycée and then studied in a technical school preparatory to his father's profession. After deciding to become a painter he worked without profit under Henri Scheffer, Delacroix, and Couture, but studied to more effect the works of the early Florentines, especially those of Giotto in Italy, being, therefore, in the main self-taught. He first exhibited in the Salon of 1850, not 1859 as is commonly stated. His first decorative works, "War" and "Peace," exhibited in 1861, were acquired by the government for the Museum of Amiens, in which his early decorations can best be studied, such as "Work and Rest" (1863); "Ave, Picardia Matrix" (1865); "Ludus Pro Patria" (1880). After the Universal Exposition of 1867, when he received the cross of the Legion of Honor (Officer, 1887; Commander, 1889), his position was secure. He was constantly employed upon Salon juries and artistic commissions, and the greater part of his time was taken by great series of mural paintings for French public buildings. Among the principal of these are two fine representations of Marseilles in ancient and modern times for the museum there; two historic scenes for the hôtel de ville, Poitiers (1874–75); the "Infancy of St. Genevieve" (1876–77), in the Panthéon at Paris—a beautiful idyllic scene; a series of splendid decorations for the museum of his native town, Lyons, among which are "Sacred Grove, Dear to the Arts and Muses" (1884), "An Antique Vision" and "Christian Inspiration" (1886). In 1889 he decorated the great hemicycle of the Sorbonne with an allegory of the noble purposes of its foundation, entitled "Alma Mater."

Puvis de Chavannes was the moving spirit in the secession of the Société Nationale des Beaux-Arts from the Salon in 1890, and he was president of the société from 1891 till his death. His decorations in the hôtel de ville, Paris, include "Hommage à Victor Hugo" (1894), in which the poet is represented as dedicating his lyre to the city, and two fine landscapes, "Summer" and "Winter." In 1896 he completed his decorations for the Boston Public Library, "The Muses Saluting the Spirit of Enlightenment" and eight fine panels of the "Arts" and "Sciences." His last monumental work was three other large paintings of the life of St. Genevieve, in the Panthéon. The last years of his life were saddened by the illness of his wife, the Princess Cantacuzene, after whose death he himself soon died.

Puvis de Chavannes was an epoch-making figure in modern mural painting. Before his day it had counterfeited reality, but he, reverting to Giotto and Ghirlandaio, restored it to its proper function, decoration. He painted in flat surfaces with unerring decorative effect and in a subdued color scheme. Eliminating the ineffective and accidental in nature, he achieved by simplification grand typical effects, both in landscape and in figure, which were with him of equal importance. His works are full of lyric sentiment and breathe the serene charm of a far-away primeval age. His large collection of drawings and careful studies was left by his nephews to the Luxembourg Museum, the city of Paris, and the Provincial museums possessing his works. Besides his mural decorations he painted a number of canvases of fine decorative quality, such as "Girls on the Seashore" (1879); the "Poor Fisherman" (Luxembourg, 1881); "Le Doux Pays," which received the medal of honor in 1882; "The Beheading of St. John Baptist" (John Quinn, New York). The Metropolitan Museum, New York, possesses "The Shepherd's Lay" and "Child Gathering Apples." Of his portraits the most interesting are those of himself at 25 and of his wife (1891), called "The Lady in Mourning," in the Lyons Gallery. Consult: Marius Vachon, *Puvis de Chavannes, un maître de son temps* (Paris, 1900); *Masters in Art*, vol. iv (Boston, 1903); *Puvis de Chavannes*, in Newnes Art Library (London, 1905); André Michel, *Puvis de Chavannes, with a Biographical and Critical Study* (ib., 1912); J. G. Huneker, *Ivory Apes and Peacocks* (New York, 1915).

PUY, pụ-ē̇′, Le. The capital of the Department of Haute-Loire, France, 37 miles southwest of Saint-Etienne, at the junction of the Loire, Borne, and Dolezon valleys (Map: France, S., H 3). It is picturesquely situated on the steep south slopes of Mont Anis, from the summit of which rises precipitously the huge basaltic mass called Rocher de Corneille, crowned by the colossal statue of Notre Dame de France, 52 feet high, on a pedestal 20 feet in height, made in 1860 from 213 Russian cannon captured at Sebastopol. The most notable building of Le Puy is the cathedral, situated in the highest part of the town and reached by a grand stairway of 136 steps. Other notable features are the prefecture, the palais de justice, the Crozatier Museum with a fine art collection, and the monumental Crozatier Fountain. Guipure and other lace, bells, and clocks are manufactured. Le Puy is the ancient Podium. It was the capital of the mediæval District of Velay. Pop., 1901, 20,507; 1911, 20,944.

PUYALLUP, pū-ăl′ŭp. A city in Pierce Co., Wash., 10 miles southeast of Tacoma, on the Great Northern and the Northern Pacific railroads (Map: Washington, C 3). It contains a State Masonic home, a G. A. R. widows' home, and a Carnegie library. The chief industrial plants are saw mills, box factories, and a fruit cannery. Raspberries are grown here in large quantities. Pop., 1900, 1884; 1910, 4544.

PUYALLUP, pū-ăl′ŭp. A tribe of Indians of Salishan stock (q.v.). They speak the same language as the Nisqualli and joined with them in the Treaty of Medicine Creek in 1854. They formerly claimed the entire territory of Puyallup River and exercised a dominating influence among the neighboring tribes. They are now chiefly confined to a reservation in the vicinity of Tacoma, and number 309.

PUY-DE-DÔME, pụ-ḗ′-de-dȱm′. A south-central department of France, formerly a part of Auvergne (q.v.) (Map: France, S., H 3). Area, 3090 square miles. Plateau and mountain occupy three-fourths of the surface; plain and valley the rest. The volcanic peaks of the Auvergne Mountains, grand in their desolation and presenting numerous extinct craters, render this region orographically one of the most interesting in France. The highest peak in the Mont Dore group has an elevation of 6187 feet. Puy-de-Dôme, 4086 feet, gives its name to the department. The principal river is the Allier (a tributary of the Loire), which from south to north traverses the fertile valley of Limagne. Rye, wheat, oats, apples, chestnuts, and grapes are cultivated. Coal is mined. There are numerous mineral springs. The mountain forests yield timber. Capital, Clermont-Ferrand. Pop., 1901, 544,194; 1911, 525,916. Consult Georges Bonnefoy, *Histoire de l'administration civile dans la province d'Auvergne et le départment du Puy-de-Dôme* (4 vols., Paris, 1895–1902), and Boule and others, *Puy-de-Dôme et Vichy* (ib., 1901).

PUZZLE. See Anagram; Lipogram; Logogram.

PUZZOLANIC (po͝ot′sȱ-lăn′ĭk) **CEMENT.** See Cement.

PUZZUOLANA, po͝ot′swȱ-lä′nȧ. See Pozzuolana.

PYÆMIA, pī-ē′mĭ-ȧ (Neo-Lat., from Gk. *πύον, pyon*, pus + *αἷμα*, haima, blood). A type of blood poisoning, or septicæmia (q.v.), distinguished by the formation of secondary metastatic abscesses in different parts of the body. Pyæmia represents a form of septicæmia in which, in addition to the general distribution of septic material throughout the body, this material containing bacteria becomes lodged at different points, thus setting up local foci of infection. These new abscesses usually occur where the blood current is slow, as in the bones, and in viscera which have a terminal circulation —the brain, spleen, lungs, and kidneys. In suppuration of the intestines the most common seat of metastasis is the liver. Pyæmia is usually preceded by thrombosis of a vein near a septic wound. The vein wall becomes inflamed; the blood current is retarded; a clot forms, which is invaded by bacteria; the clot becomes softened, pieces of it are broken off and carried along by the blood stream until the capillaries are reached, and the *embolus*, as it is now called, is arrested. When an embolus lodges in an organ having a terminal circulation, that part of the organ supplied by the blocked vessel becomes anæmic and breaks down into an abscess, which in turn may become a focus for the manufacture of more emboli. Metastases in the lungs occur chiefly near the pleural surface and in the lower lobes. Serous effusion, often with much fibrin, may occur into the pleural and pericardial cavities. Local inflammation of joints, especially of the knee and shoulder, may occur. With the exception of those occurring in serous membranes, these inflammations are usually purulent in character. An increase in the number of white blood cells (leucocytosis) is of constant occurrence. While other species of bacteria act as occasional excitants of pyæmia and septicæmia, two species of pyogenic bacteria—the staphylococcus and streptococcus and especially the latter—are usually concerned. (See Bacteria.) Other microörganisms may act as causative factors.

Pyæmia is very often a fatal complication. It is marked by recurrent chills and sweats and by a high and irregular fever of the intermittent type. The breath has a sweetish odor, the tongue is brown and parched, and emaciation is rapid. The disease may run its course in a few days or last for months. Treatment consists in eliminating the original focus if possible, incising secondary abscesses when accessible, and drawing off the fluid from serous cavities. Stimulants, of which alcohol is the best, must be freely given, and these, with iron and quinine, constitute the most reliable therapeutic aids. Specific serums and vaccines have been found rather disappointing. See Sfpticæmia.

PYAT, pyȧ, Félix (1810–89). A French Communist and journalist. He was born at Vierzon and trained for the law. After the failure of the Socialist call to arms in 1849, he escaped to Switzerland. Thence he went to Belgium and England as a member of the European Revolutionary Committee. The events of 1870 brought him back to France to take active part in the Commune. He was a prime mover in the overturning of the Vendôme Column and on the collapse of the Commune escaped to London. In his absence he was condemned to death (1873), but he was pardoned (1880) and elected deputy from Marseilles (1888). He contributed to many newspapers and edited several revolutionary journals. He wrote several very popular Socialistic plays, of which *Mathilde*, *Diogène*, and *Le chiffonnier de Paris* are characteristic.

PYATIGORSK, pyȧ′tyḗ-gôrsk′, or **PIATIGORSK.** A noted watering place on the left bank of the Podkumsk in the Territory of Terek, north Caucasia, situated on the south slope of the Mashuka and south of the Beshtau, 124 miles by rail northwest of Vladikavkaz. There are about 20 sulphur springs ranging in temperature from about 84° F. to 117.5° F. and used both for bathing and drinking. It has some importance as a trade centre. Pop., 32,000.

PYC′NOGON′IDA. See Pantopoda.

PYC′NOSTYLE. See Intercolumniation.

PYD′NA (Lat., from Gk. *Πύδνα*). A Greek settlement in ancient Macedonia, on the west coast of the Thermaic Gulf. It seems to have passed early into the power of the Macedonians, but appears from time to time as independent. In the fourth century B.C. it was a dependency of Athens, but was captured by Philip II (father of Alexander the Great), who converted it into a strong fortress. Near it took place in 168 B.C. the great battle between the Romans under Æmilius Paulus (q.v.) and the Macedonian King Perseus, in which the latter was defeated and the Macedonian Empire destroyed. Consult Johannes Kromayer, *Antike Schlachtfelder in Griechenland*, vol. ii (Berlin, 1907).

PYE, Henry James (1745–1813). An English poet laureate, eldest son of Henry Pye of Faringdon in Berkshire. He was educated at Magdalen College, Oxford (M.A., 1766; D.C.L., 1772), and entered Parliament, but retired in 1790. He collected his poems in 1787 under the title *Poems on Various Subjects.* Though he was a tame versifier, he became laureate in 1790 through the favor of Pitt. The appointment met with ridicule, and his annual birthday ode was long a merry incident among literary men. Pye's most ambitious poem was an epic in six books on Alfred (1801). He also translated Bürger's *Lenore* (1785) and the *Poetics* of Aristotle and wrote novels and plays.

PYELITIS, pī'ē-lī'tĭs (Neo-Lat., from Gk. πύελος, *pyelos*, trough, pan, pelvis). Inflammation of the pelvis of the kidney. It may be caused by kidney stones, or by infection extending from the bladder. It arises sometimes during typhoid fever, scarlet fever, diphtheria, or smallpox, and may be caused by tuberculosis or cancer. Severe pains in the loins accompany the disease. The urine contains a variable amount of pus and blood. The severe forms caused by the presence of kidney stones require surgical treatment (removal of the calculi). In lighter cases regulation of the diet and avoidance of all stimulating drinks will prove beneficial.

P'YENG-YANG, pyĕng'-yäng', or **P'YUNG-YANG**. A town of Korea. See PINGYANG.

PYGMA'LION (Lat., from Gk. Πυγμαλίων). A legendary king of the island of Cyprus. Enamored of a beautiful ivory statue which he had made, he requested Venus to give it life. His prayer was granted, and the vivified statue bore him a daughter, Paphos, who, according to some, became by Apollo mother of Cinyras, the founder of Paphos. Others told how Cinyras married Metharme, daughter of Pygmalion. The love of Pygmalion for his statue is told by Ovid (*Metam.*, x, 243). According to another version Pygmalion conceived a passion for the temple statue of Aphrodite herself. In modern times the name Galatea is often associated with that of Pygmalion, but for this there is no ancient authority. Consult C. M. Gayley, *The Classic Myths in English Literature and in Art* (2d ed., Boston, 1911).

PYGMIES, pĭg'mĭz (Lat. *Pygmæus*, from Gk. Πυγμαῖος, *Pygmaios*, pygmy, dwarf, of the length from the elbow to the knuckles, from πυγμή, *pygmē*, measure from the elbow to the knuckles, fist; connected with Lat. *pugnus*, fist). All peoples whose short stature is a racial trait rather than the result of adverse conditions of life; usually races with a male average height of not more than 1.50 meters (4 feet, 11 inches) are recognized as pygmies. According to Kollmann, the ancestors of the human race were pygmies, but this conclusion has failed of general acceptance. Under the term "pygmy" we may discuss (1) the wavy-haired Asiatic pygmies; (2) the woolly-haired Negritos; (3) the woolly-haired Central African pygmies, sometimes referred to as Negrillos.

(1) The Wavy-haired Asiatic pygmies include the Sakai or Senoi of the southern part of the Malay Peninsula, the Toala of Celebes, the Vedda, and some jungle tribes of the Deccan. All these are generally considered survivals of a formerly widespread pre-Dravidian race, which some scholars connect with the Australians. Some of these tribes are slightly taller than the pygmies as defined above and show indications of mixture with another race. They differ from (2) and (3) in the shape of the head, which is dolichocephalic.

(2) The Negritos include the Andaman Islanders (Mincopie), the Semang of the central regions of the Malay Peninsula, the Aeta of Luzon and other islands in the Philippines, and the Tapiros, as well as possibly additional peoples, of New Guinea, where the other tribes reported as pygmy are, however, mixed breeds.

(3) The occurrence of African pygmies, called Obongo, averaging 4 feet, 7 inches, was reported by Du Chaillu from the territory of the Ashango on the west coast, but little credence was given to his accounts until among the Mangbettu Schweinfurth determined the existence of the Akka, whose stature hardly ever exceeded 4 feet, 10 inches. Since then pygmy tribes have been found widely scattered in the equatorial forest regions of Africa, the name commonly applied by the taller Bantu being Batua (Batwa); this name, is, however, confusing, as it occasionally refers not to pygmies but merely to tribes shorter than the speakers. Von Luschan believes that these pygmies and the Bushmen of South Africa are genetically related. In a broad classification the Negritos and Negrillos seem to belong together. Culturally the pygmies of all types represent a very simple grade. In general they are nomadic hunters and lack a definite social organization. See DWARF.

Bibliography. Sir W. H. Flower, "The Pygmy Races of Men," in *Journal of the Anthropological Institute*, vol. xviii (London, 1888–89); Armand Quatrefages de Bréau, *The Pygmies*, translated by Frederick Starr (New York, 1895); A. H. Keane, *Man: Past and Present* (Cambridge, 1899); Sir H. H. Johnston, *Uganda Protectorate* (London, 1902); Armand Hutereau, *Notes sur la vie familiale et juridique de quelques populations du Congo belge* (Brussels, 1910), with map of Congo Pygmies; A. C. Haddon, "The Pygmy Question," in A. F. R. Wollaston, *Pygmies and Papuans* (New York, 1912); Von Luschan, in *Zeitschrift für Ethnologie* (Berlin, 1914).

PYGMY FINCH. See GRASSQUIT.

PYGMY OWL, or **GNOME OWL.** One of a group of about 30 species of the genus *Glaucidium.* With the exception of Australia, Canada, and the eastern United States, they are found over much of the tropical and temperate regions. They have a small head without ear tufts, short and rounded wings, and densely feathered legs. Four forms of the American Pygmy Owl (*Glaucidium gnoma*) are known from the West and Southwest. They frequent wooded districts and are diurnal, flying about and feeding in bright sunshine. Small birds pay but little attention to them, although, besides their regular diet of insects, mice, and lizards, they occasionally catch birds. The nest is placed in the deserted hole of a woodpecker.

PYGMY PARROT. One of the diminutive parrots of New Guinea, of the subfamily Nasiterninæ, which are smaller than a song sparrow. They have beaks like those of miniature cockatoos and short square tails; the males have gorgeous plumage, but the females are more soberly dressed.

PYGOP'ODES (Neo-Lat. nom. pl., from Gk. πυγή, *pygē*, rump + πούς, *pous*, foot). An order of birds, originally including the grebes, loons, auks, murres, and puffins. This is now known to be an unnatural assemblage, and the use of the term has been abandoned in this sense. It is properly retained by some writers as the name of an order equivalent to Colymbiformes of others, including only the loons and grebes.

PYLE, HOWARD (1853–1911). An American illustrator, painter, and author. He was born in Wilmington, Del., March 5, 1853, and studied art at a private school in Philadelphia and at the Art Students' League, New York. He started his career as an illustrator for *Harper's Monthly,* to which he contributed for many years. In 1879 he returned to Wilmington, where he afterward resided and taught. Pyle was one of the foremost American illustrators, especially successful in work for children. A master of linear composition and a keenly observant realist, he was bold and original in his sense of design and equally efficient in pen-and-ink, wash drawings, and oils, in which medium many of his later illustrations were executed. His best subjects were taken from the colonial periods of New England and New Amsterdam, from the days of chivalry, and from the life of adventurers and seafaring men. Pyle possessed genuine humor, historical knowledge, and decided literary ability, often writing the text for his illustrations. He was author and illustrator of the *Merry Adventures of Robin Hood* (1883); *Pepper and Salt* (1885); *The Rose of Paradise* (1887); *Men of Iron* (1891); *Twilight Land* (1895); *The Garden behind the Moon* (1895); *Rejected of Men* (1903); *The Champions of the Round Table* (1905); *The Story of Sir Launcelot* (1907); *Stolen Treasure* (1907). Pyle's influence as a teacher at the Drexel Institute, Philadelphia, was important. Probably his most notable pupil was Maxfield Parrish (q.v.). He was elected a National Academician (1907) and received a gold medal at Buffalo (1901). His death occurred Nov. 9, 1911.

PYLO'RUS. See ALIMENTARY SYSTEM.

PY'LUS, or **PYLOS** (Lat., from Gk. Πύλος). An ancient town of Messenia in the Peloponnesus, on the promontory of Coryphasium at the northern entrance to the Bay of Pylus (Navarino), connected in early Greek legend with Neleus and his son Nestor (Map: Greece, Ancient, B 3). After the conquest of Messenia by the Spartans the place seems to have been abandoned, until in 425 B.C. it was occupied by the Athenian general Demosthenes, who fortified the promontory and successfully repelled assaults of the Spartans by sea and land. The Athenians held Pylus for 15 years, when it was recaptured by the Spartans and again fell into obscurity, though after the restoration of the Messenians it became the port of Messenia. At the end of the thirteenth century it was fortified with a strong Venetian castle, and another was built at the southern entrance to the bay, near the town of Navarino, generally regarded as Pylos. The mediæval name is due to the settlement here in 1381 of Navarrese mercenaries, though others derive it from Avarino and trace it to an Avar settlement 800 years earlier. In the bay was fought, on Oct. 20, 1827, the great naval battle of Navarino (q.v.), in which the Turkish-Egyptian fleet was destroyed by the united English, French, and Russian fleets under Admiral Codrington. Consult Baedeker, *Greece,* 413–415 (4th Eng. ed., Leipzig, 1909); J. G. Frazer, *Pausanias's Description of Greece* (2d ed., New York, 1913). See GREECE, *History,* The War for Independence; NAVARINO.

PYM, JOHN (1584–1643). An English parliamentary leader, born at Brymore in Somersetshire. In 1599 he entered what is now Pembroke College, Oxford, but did not graduate, and in 1602 entered the Middle Temple, though he was never admitted to the bar. There is some doubt whether Pym sat in the Parliament of 1614, but in any case he was not prominent until the Parliament of 1621. He was a Puritan, and his first speeches in Parliament were directed against the Catholics, not so much, however, on account of their religion as on account of their politics. He became so obnoxious to the court that he was imprisoned for three months in his home in London. In the first three parliaments of Charles I he was the leader in the impeachment of Montagu and Manwaring, two clergymen who had attacked Calvinistic doctrines and treated the Parliament with scant respect, and he was prominent in the impeachment of Buckingham. He was also prominent in the agitation which preceded the Petition of Right (q.v.). Nothing is heard of him in the intervals between parliaments. During the 11 years of Charles's personal government he was intimately connected with various schemes for the settlement of the Connecticut valley. In 1640, on the meeting of the Short Parliament, Pym became its real leader, though no formal leadership was recognized in those days, and his influence over the Puritan party continued undiminished until his death. He opened the Short Parliament with a speech two hours in length, setting forth the grievances of the nation, and persuaded the Parliament to postpone the supplies until these grievances were redressed. On the opening of the Long Parliament, which met likewise in 1640, Pym was resolved to proceed to extremities. He introduced and conducted the impeachment of Strafford for high treason in attempting to subvert the constitution, but he resisted in vain the dropping of the impeachment and the introduction of the bill of attainder, though it was due to his efforts that, notwithstanding the bill of attainder, Strafford was heard in his own defense. The Triennial Act (q.v.) was largely his measure. The adherence of the Bishops to the cause of Charles I led to the demand for their abolition, and Pym supported the "Root and Branch" bill which was introduced for this purpose, though it was not his intention to introduce Presbyterianism.

He naturally took a prominent part in drawing up and passing the Grand Remonstrance (q.v.) in 1641, and he even proposed at this time to hold the King in check by making his ministers responsible to Parliament. On the unsatisfactory outcome of the campaigns in 1642, Pym favored and carried out, though reluctantly, the union with the Scots, with the unwelcome condition of the acceptance of the Covenant and the introduction of a Presbyterian form of Church government. Even before the meeting of the Long Parliament Pym may have had communication with the Scots, and he was the leader of the five members whom Charles on Jan. 4, 1642, attempted in vain to arrest in person on the floor of the House of Commons on the charge of treasonable conspiracy. Consult: John Forster, *Statesmen of the Commonwealth of England* (5 vols., London, 1841–44); Goldwin Smith, *Three English Statesmen* (new ed., London, 1868); S. R. Gardiner, *The Great Civil War* (4 vols., ib., 1893); I. A. Taylor, *Revolutionary Types* (ib., 1904).

PYNCHEON, pĭn'chon, CLIFFORD. A broken-down elderly man in Hawthorne's *House of the Seven Gables.*

PYN'CHON, John (1621–1703). An American colonist, born in Springfield, Essex County, England. He was brought to Massachusetts when a child by his father, William Pynchon (q.v.). By inheritance and by purchase from the Indians he obtained large tracts of land in the Connecticut valley, on which he established Northampton, Hadley, Deerfield, and other towns. His diplomacy in treating with the Indians was of great service to the Colony. He held many important public offices, including that of councilor under Sir Edmund Andros in 1688–89 and again under the new charter from 1693 until his death.

PYNCHON, Thomas Ruggles (1823–1904). An American clergyman and educator, born in New Haven, Conn. He graduated at Trinity College, Hartford, and in 1849 was ordained. His first charge was in Boston, and afterward he had churches in Lenox and Stockbridge, Mass. (1849–54). He was Scoville professor of chemistry and natural sciences at Trinity from 1854 until 1877 and from 1874 until 1883 was president of that institution. In 1887–1902 he was professor of moral philosophy there.

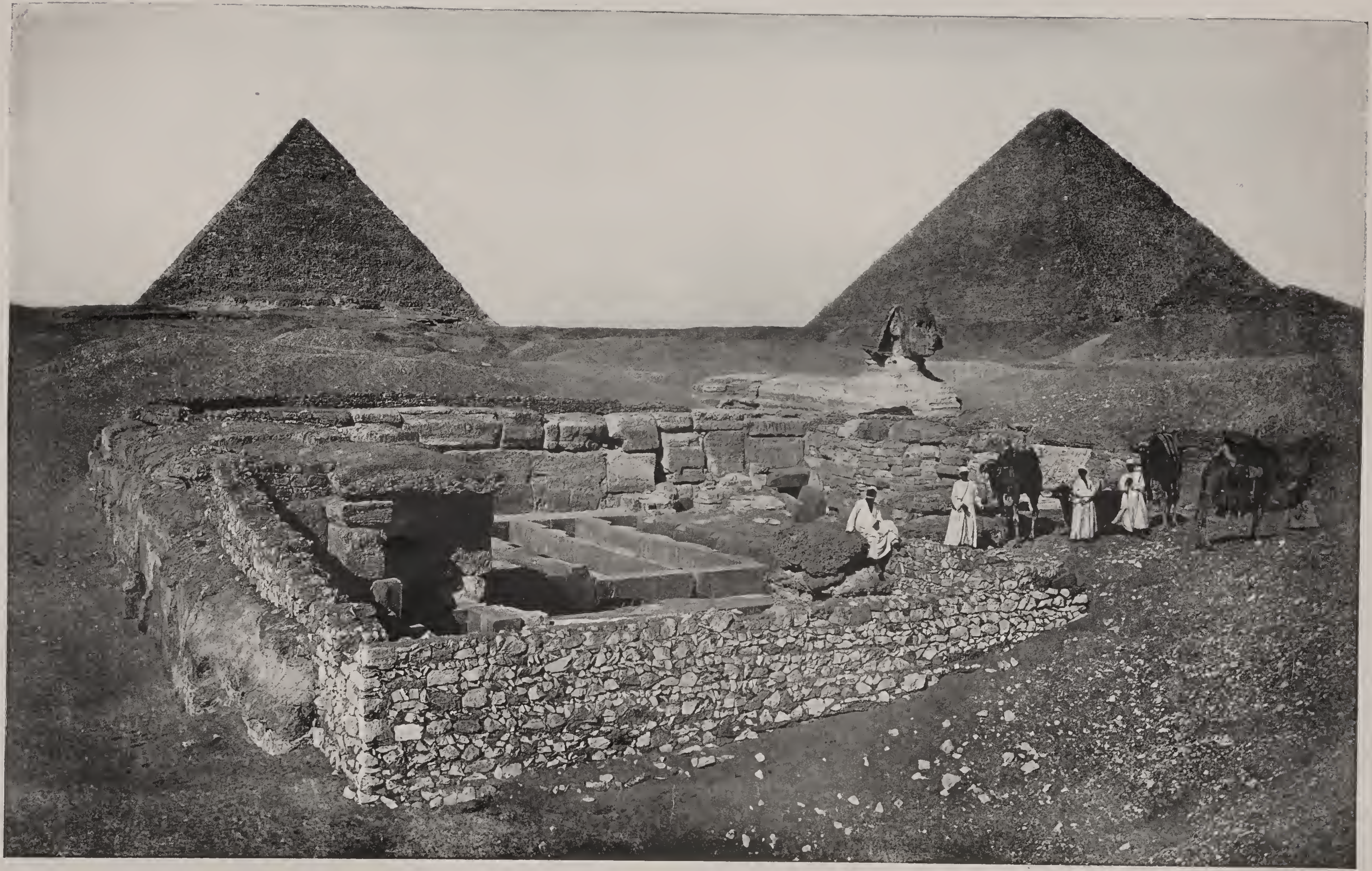
PYNCHON, William (1590–1662). An American colonist and theologian. He was born at Springfield, Essex, England. He emigrated to the Colony of Massachusetts in 1630 and was treasurer of the Colony in 1632–34. He was one of the first settlers of Springfield (1636). On a visit to England in 1650 he published *The Meritorious Price of our Redemption, Justification, etc., Clearing it from Some Common Errors.* The strongly anti-Calvinistic position of this work made it very unacceptable to the Puritan clergy, and on his return to Massachusetts he was condemned by the Legislature, which, in 1650, ordered his book to be burned in Boston market. As the result of further study he retracted some of his opinions, but his position in America continued unsatisfactory, and in 1652 he returned to England and settled at Wraysbury, near Windsor. He replied to his principal critic, Rev. John Norton, in the second edition of his book (1655). Consult: H. M. Dexter, *Congregationalism of the last Three Hundred Years as Seen in its Literature* (New York, 1880); W. F. Adams, *Pynchon Family* (Springfield, Mass., 1898); F. H. Foster, *Genetic History of New England Theology* (Chicago, 1907).

PYN'SON, Richard (?–1530). One of the early London printers, by birth a Norman. He undoubtedly learned his trade in Normandy, and not under Caxton, as has been often asserted. Some time before 1493 he began printing near Temple Bar, and about 10 years later he moved to Fleet Street. Pynson issued some of the most beautiful books published at that time in England. From his press proceeded more than 300 books. Among the earliest were Chaucer's *Canterbury Tales* (1493); Parker's *Dialogue of Dives and Pauper* (1493); *Terence* (1496), the first classic printed in England; the *Morton Missal* (1500), representing his finest work. He became printer to Henry VIII, from whom he received a pension. It was he who introduced (1509) Roman type into England.

PYORRHŒA (pī'ŏr-rē'ȧ) **ALVEOLARIS** (Neo-Lat., from Gk. *πύον*, *pyon*, pus + *ῥοία*, *rhoia*, flow); Rigg's Disease; Interstitial Gingivitis. A chronic destructive disease of the sockets of the teeth. In the beginning of the disease patients are unaware of any discomfort or abnormal symptoms. In the later stages there is a dull, gnawing pain about the roots of the teeth and still later tenderness on chewing food. The gums are deep red in color and tend to fall away from the teeth. They bleed at the slightest touch, even during the process of brushing or examination. Sometimes pus exudes between the gums and the teeth when the former are pressed upon. The teeth eventually become loose and drop out or have to be extracted. Treatment consists in the removal of tartar or other deposits found upon the exposed cementum. Pus pockets have to be washed out and disinfected, preferably with a weak solution of iodine, hydrogen dioxide, or physiological salt solution. Tooth powders and mouth washes have very slight curative effects, although they may be used to prevent the development of pyorrhœa. In addition to the merely destructive effect upon the teeth, many cases of obscure digestive disturbances, and particularly chronic joint affections and endocarditis, have been traced to suppuration about the teeth. Arthritis deformans is the most frequently complicating disorder. The microörganisms regarded as chiefly responsible are the staphylococcus, streptococcus, and pneumococcus, all pus-producing cocci, but the most virulent germ and the one most provocative of complications is the streptococcus. Bass and Johns made an important contribution to the pathology of Rigg's disease when they discovered that the *Endamœba buccalis* was present in 85 out of 87 cases examined, and also showed that rapid improvement or cure followed the injection of emetine hydrochloride. Consult Bass and Johns, *Alveolodental Pyorrhœa* (Philadelphia, 1915).

PYRA, pē'rȧ, Immanuel Jakob (1715–44). A German poet. He was born in Kottbus, studied theology at Halle, where he joined S. G. Lange's (q.v.) Dichterbund, and with Lange lived at Laublingen. The two poets published *Freundschaftliche Lieder* (1746), which, with their delight in the poetry of religion and friendship and in unrhymed verse, foretell Klopstock. Pyra boldly and rather pedantically attacked Gottsched (q.v.) in 1736 with *Erweis dass die Gottschedianische Sekte den Geschmack verderbe* (1743), and his premature death was partly due to the bitter personalities with which the attack was returned.

PYR'AMID (Lat. *pyramis*, from Gk. *πυραμίς*, pyramid, from Egyptian *per-em-us*, coming out in breadth, denoting probably the ratio of the base to the height). A polyhedron (q.v.) one of whose faces (the base) is a polygon and whose lateral faces are triangles. A pyramid is said to be regular when the base is a regular polygon and the vertex lies in the perpendicular to the base erected at its centre. The altitude is the perpendicular distance between the base and the vertex. The slant height of a regular pyramid is the altitude of any one of the triangles which make up its lateral faces. When a pyramid is cut by a plane the portion containing the base is called a truncated pyramid; if the intersecting plane is parallel to the base the truncated pyramid becomes a frustum of the original pyramid. The formula for the volume of a pyramid is $V = \frac{1}{3}bh$ and for the frustum $V = \frac{h}{3}(b + b' + \sqrt{bb'})$, where b and b' are the bases and h is the altitude. Consult Holzmüller, *Elemente der Stereometrie* (Leipzig, 1900–02).



PYRAMIDS

PYRAMIDS OF CHEOPS AND CHEPHREN SPHINX AND TEMPLE OF CHEPHREN

PYRAMID. A solid structure, usually of stone, having a square base and triangular sides meeting in an apex. True pyramids are found only in middle Egypt and date from the period between the fourth and twelfth dynasties, though a few may be somewhat older. Pyramidal buildings occur elsewhere, but they differ in important particulars. The pyramids of Mexico, e.g., have flat tops and the sides form successive stages or steps. Those of Abydos and Meroë are merely imitations of pyramids on a small scale; they are really sepulchral chambers having the pyramidal form externally, and are usually provided with porticoes representing the funerary chapels of older tombs. The pyramids found at Cenchreæ and at Rome are sporadic attempts to reproduce the Egyptian type.

With regard to the mode of construction of the pyramids of Egypt, two principal theories have been advanced. Lepsius, followed by Ebers, and more recently by Borchardt, believed that each king, on ascending the throne, began to build a pyramid as a tomb and monument for himself. This was usually laid out upon a comparatively small scale, so that if the builder had but a short reign his tomb might be complete. As time passed, successive layers were added, and the size of the monument was thus proportioned to the length of the builder's reign. This theory is combated by Petrie (q.v.), who believes that each pyramid was begun and carried out upon a definite design of size and arrangement. The plan was occasionally altered, but in such cases the alteration was not gradual, but sudden. The outer casing of the pyramids was invariably of massive blocks of fine stone, well joined and carefully polished. The interior of the mass varied at different periods. In the oldest pyramids it was formed, so far as is known, of courses of rough-hewn blocks laid with a little mortar. In later times the core was formed of brick and rubble inclosed between inner and outer walls of solid masonry, and under the twelfth dynasty the core is almost entirely of sun-dried bricks. Each pyramid contained a sepulchral chamber, which was always low down and was usually excavated in the rock underlying the structure. It was reached by a passage opening from the northern face of the pyramid and passing, in its course, through one or more lesser chambers. The external entrance was usually situated above the level of the sepulchral chamber, and the passage sloped downward at a moderate angle. Pyramids seem to have stood originally within walled inclosures, and traces of the walls are still to be found in many cases. To each pyramid was attached a temple in which the funerary worship of the deceased Pharaoh was conducted by priests who were supported by a regular endowment. Such temples are still to be seen at Ghizeh, and the priests of the various pyramids are frequently mentioned in the Egyptian inscriptions. Around the pyramid of each king are grouped the tombs (mastabas) of the nobles and high functionaries who had lived under his reign.

The pyramids that now exist in Egypt, some 75 in number, extend in groups from Abu Roâsh on the north to Medum on the south. The group of Abu Roâsh consists of three pyramids all ruined; the largest of them has lost its outer casing and is now a shapeless mass of Nile mud inclosing a nucleus of massive stone. One of the others still contains a sepulchral chamber and the passage leading to it. Farther to the south lies the group of Ghizeh, by far the most important among the Egyptian pyramids. The largest of the group is the *Great Pyramid*, the tomb of Cheops (q.v.), the second King of the fourth dynasty. It was called by the Egyptians *Yechwet Chufu* (the glory of Chufu) (Cheops). Its present perpendicular height is 451 feet, but originally, including the nucleus of rock at the bottom and the apex which has disappeared, it measured 482 feet, or more than 50 feet higher than St. Peter's at Rome. The sloping sides, which rise at an angle of 51° 50′, are now 568 feet in slant height and have a length of 750 feet at the base. The cubic contents amount to about 3,057,000 cubic yards, representing a weight of no less than 6,848,000 tons. According to Petrie's estimate the pyramid contains about 2,300,000 blocks of stone averaging some 40 cubic feet in size. In its present condition this immense edifice covers a space of nearly 13 acres. The material of which it is constructed consists of stone from the Mokattam and Tura hills on the opposite side of the Nile. Traces of the road by which the stone was conveyed are still visible. The outer casing of this pyramid has long since disappeared, and the underlying courses of rough-hewn stone now form a series of steps. The entrance is in the north face of the pyramid at the height of about 48 feet from the ground. From it there was a narrow passage, 3 feet, 4 inches high by 3 feet, 11 inches wide, which, after descending into the interior at an angle of 26° 41′ for a distance of 293 feet, terminates in a horizontal corridor, 27 feet long, 3 feet high, and 2 feet wide, leading to a subterranean chamber hewn in the solid rock. This chamber is 46 feet long, 27 feet wide, and 10½ feet high. Its floor lies 101½ feet below the level upon which the pyramid is built, and a blind passage opens from its farther end. Some 60 feet from the external entrance a second passage branches off from the long descending passage and ascends at about an equal angle for a distance of 121 feet, when it enters the Great Hall. At this point a horizontal corridor leads from the ascending passage to the so-called Chamber of the Queens, which is 17 feet long, 18 feet, 10 inches wide, and 20 feet high. The Great Hall, which continues the ascending passage, is 28 feet high and 155 feet long, but is very narrow, the width of the lower part being 3 feet, 4 inches and that of the upper part only 2 feet, 7 inches. It terminates in a horizontal passage 122 feet long and 3 feet, 8 inches high, expanding about the middle into an antechamber. At the end of the horizontal passage is the King's Chamber, the most remarkable of all the chambers in the pyramid. The northern and southern sides are each 17 feet in length, the eastern and western sides 34½ feet, and the height is 19 feet. The floor is 139½ feet above the plateau upon which the pyramid stands. The chamber is lined with finely polished granite slabs, and the ceiling is formed of nine great blocks of granite, each 18½ feet long. Within the chamber is a mutilated stone sarcophagus, the lid of which has disappeared. In order to relieve the roof of the pressure of the superincumbent mass of masonry, five hollow chambers were constructed above it. The first four have flat ceilings, while the last is roofed with blocks bearing obliquely against each other. Two air shafts (8 × 6 inches) run from the King's Chamber to the northern and southern faces of the pyramid. Near the Great Pyramid, on the east side, are three small pyramids built for members of Cheops's family; a few hundred yards to the southeast is the Sphinx (q.v.).

The *Second Pyramid*, situated about 200 yards southwest of the Great Pyramid, was erected by Chephren (q.v.), the successor of Cheops, and was called by the Egyptians *Wer-Chafrê* (great is Chephren). Its present perpendicular height is 450 feet (formerly 458 feet), while the sloping sides, measuring each 694½ feet at the base, rise at an angle of 52° 20′ to the height of 566¾ feet. Part of the original casing still remains at the top. The fact that it stands upon a higher level than the pyramid of Cheops gives it the appearance of greater height. The rocky ridge upon which it is built rises somewhat towards the west and north, and a considerable part of it had to be cut away in order to secure a level surface. The leveled space around the base of the pyramid was paved with blocks of limestone. Two passages, both on the north side, give access to the interior. One of these is in the pavement in front of the pyramid, the other is 38 feet above the surface of the ground. The upper passage descends at an angle of 25° 55′ to a depth of 105 feet and leads through a horizontal corridor to the sepulchral chamber called, from its discoverer, Belzoni's Chamber. It is hewn in the rock and is 46½ feet long, 16⅓ feet wide, and 22½ feet high. Belzoni, who opened the pyramid in 1818, found in this chamber a granite sarcophagus filled with rubbish. The lower passage, beginning in the pavement in front of the north face of the pyramid, first descends at an angle of 21° 40′, then runs horizontally for 59 feet, and then ascends, terminating in the horizontal corridor leading to Belzoni's Chamber; the total length of the passage is 97 feet. Near the middle of its horizontal portion a small chamber is introduced, and a descending passage, 22 feet long, leads to another chamber, 34 feet, 3 inches long, 10 feet, 4 inches wide, and 8 feet, 5 inches high.

The *Third Pyramid*, called by the Egyptians *Neter-Menkaurê* (Menkaurê is divine), was built by Menkaurê, the successor of Chephren and the Mycerinus of Herodotus. Its perpendicular height is 204 feet, and the sides, which slope at an angle of 51°, rise to the height of 262¾ feet. Each side measures 356½ feet at the base. The lower part of the pyramid is cased with slabs of polished red granite. The entrance is about 13 feet above the ground on the north side. From it a passage slopes down at an angle of 26° 2′ for a distance of 104½ feet, then, becoming nearly horizontal, passes through an antechamber 12 feet long, 10 feet wide, and 7 feet high, and finally enters a large chamber 44½ feet long, 12½ feet wide, and 13 feet high, in which were found the remains of a stone sarcophagus. From the floor of this chamber a shaft leads to the tomb chamber, which lies below. It is paved with fine granite blocks and has an arched roof formed of blocks placed against each other at an angle and hollowed out on the inside. In this chamber Colonel Vyse found the basalt sarcophagus of Mycerinus, but it was lost at sea in 1838 while being conveyed to England. In the chamber above were found a part of the wooden coffin of the King and some fragments of his mummy. To the south of this pyramid are three small pyramids, probably constructed for members of the family of Mycerinus.

South of Ghizeh are the pyramids of *Abusir*, the ancient Busiris, erected by kings of the fifth dynasty. The entrances of these pyramids are, as usual, on the north side, and in all of them the tomb chamber is reached by a passage at first slanting and afterward horizontal. The northernmost of the three largest pyramids (originally 14 in number) is that of Sahurê, the second King of the fifth dynasty. Its perpendicular height, originally 163½ feet, is now only 118 feet. The central pyramid is that of Rê-en-woser, the sixth King of the same dynasty. The largest of the three, which has a perpendicular height of 165 feet (formerly 229 feet), has not yet been identified. The other pyramids of this group are mere heaps of ruins.

The burial field of Saqqâra contains a considerable number of pyramids. Of special interest is the so-called step pyramid, the tomb of Zoser, the second King of the third dynasty. It rises in six steps which are respectively 38, 36, 34½, 32, 31, and 29½ feet in height; the width of each step is from 6 to 7 feet. The perpendicular height is 197 feet. The interior of the pyramid contains a very numerous and complicated series of passages and chambers. According to Petrie it is not a true pyramid at all, but a mastaba enlarged by successive additions into the pyramidal shape. The slope of the sides (about 75°) differs considerably from that of the true pyramids. Near it is the pyramid of Unas, the last King of the fifth dynasty, and in the vicinity are the pyramids of the Pharaohs Teta, Pepi I, Mer-en-rê, and Pepi II of the sixth dynasty. These pyramids were opened in 1881, and the walls of their chambers were found to be covered with long religious texts.

South of Saqqâra are the pyramids of Dahshûr, which are in a simple and massive style much like those of Ghizeh. The group consists of two large and two smaller pyramids of stone and two of mud bricks, the latter being usually known as the black pyramids. The more northerly of the two brick pyramids, which formerly had a casing of stone, is the tomb of Usertesen III of the twelfth dynasty. Its present height is 90 feet. To the southwest of it is a large stone pyramid 326 feet high and 702 feet in width. To the south and east are the remains of other pyramids, and still farther to the south is a pyramid of peculiar form, usually termed the blunted pyramid. The lower portion slopes at an angle of 54° 41′, while the sides of the apex form an angle of 42° 59′. It is 321 feet in height and 620 feet square. The name of the builder is unknown, but it probably belongs to the oldest period of Egyptian history.

The next group of pyramids, south of Dahshûr, is the group of Lisht, of which the more southerly is the tomb of Usertesen I of the twelfth dynasty. Still farther south is the pyramid of Medum (q.v.). To the west of Medum, on the edge of the Fayum, are the pyramids of Illahun and Hawâra, the former the tomb of Usertesen II, the latter that of Amenemhat III. The pyramid of Illahun is built with a framework of stone filled up with mud bricks, while that of Hawâra is built entirely of mud bricks, though it was doubtless originally cased over with fine stone.

Outside of Egypt the pyramid never assumed national or characteristic importance, except perhaps in Central and South America, especially Peru. Even there what are called pyramids are more properly vast platforms with sloping sides richly carved. Some of these have been explored by the Yale expeditions under Professor Bingham. Pausanias (ii, 25) describes certain Greek pyramids between Argos and Epidaurus, and Varro, quoted by Pliny, the tomb of Lars Porsena at Clusium, consisting of five steep-sided pyramids on a vast podium 300 feet square. The zikkurats of ancient Assyria were a species of stepped pyramid. At Rome the tomb of Caius Cestius near the San Paolo gate is a true pyramid of stone, about 90 feet high. See FOUNDATION.

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PYR′AMUS (Lat., from Gk. Πύραμος) **AND THISBE,** thĭs′bē̇ (Lat., from Gk. Θίσβη). Two lovers whose tragical history is told by Ovid, *Metamorphoses*, iv, 55–465. They were natives of Babylon and immediate neighbors. But though tenderly attached to each other, their parents would not consent to their marriage, and they were obliged to content themselves with stolen interviews through an opening in the wall between their gardens. On one occasion they arranged to meet at the tomb of Ninus, where Thisbe, who was first at the trysting spot, was startled by a lioness. She fled, leaving her veil behind, which the fierce animal tore and covered with blood. Soon after Pyramus appeared, and, seeing the bloody veil, believed that his mistress had been murdered, and killed himself. Thisbe now returned and, beholding her lover lying dead on the ground, put an end to her own life.

PYRAR′GYRITE (from Gk. πῦρ, *pyr*, fire + ἄργυρος, *argyros*, silver). A sulphantimonite of silver that crystallizes in the hexagonal system, has a metallic lustre, and is dark red or black in color, the latter color being best seen by transmitted light. When found in quantity it is a valuable silver ore.

PYRENEES, pĭr′ē̇-nēz. A high mountain chain of Europe, extending from the southeast corner of the Bay of Biscay to the Mediterranean. The Cantabrian Mountains of the north coast of Spain are a continuation of the Pyrenees, so that the entire mountain system extends from Cape Creus in the Mediterranean to Cape Toriñana on the northwest coast of Spain, a distance of 630 miles; but the name Pyrenees is applied only to that part of the system which forms the boundary between France and Spain and which has an east and west extension of about 280 miles. The mountains, with an area of over 20,000 square miles, form the water parting between the rivers of France and Spain and form an effective barrier between the two countries. Unlike the Alps, which have a number of passes practicable for wagon roads, the Pyrenees are a true sierra whose sawlike ridges are notched only a little below the level of the peaks, so that but two passes practicable for wagons exist between the two extremities—the Col de la Perche between the valleys of the Tet and the Segre and the Col de Somport (traversed by Hannibal) on the old Roman road from Saragossa to Oloron. The highways that start as roads generally merge into mule paths and are valueless for commerce. The two railroads between France and Spain cross the low coastal strips at the extremities of the mountains, and are thus greatly deflected from direct routes, so that most of the commerce between the two countries is carried by sea.

The Pyrenees were upheaved above the sea during the latter part of the Eocene epoch, when a large part of Europe was buried under the ocean, but most of the foldings are of Oligocene age and contemporaneous with the Alps. Granite forms the kernel of the mountain system and is overlaid by masses of chalk and sandstone. The culmination of the mountains is only 11,168 feet above sea level; and, owing to the far extending south slope, which falls gently to the plain of Spain, the mean height of the mountain mass is only about 3500 feet.

The mountains do not form a continuous chain or two chains between the Atlantic and the Mediterranean. The surveys, especially on the Spanish side, seem to show that no continuous line forms the culminating portion of the Pyrenees, but that this backbone of the mountains is a series of broken chains which do not coincide with the water parting between France and Spain, but cross this divide obliquely. Some of these broken chains extend from northwest to southeast, and others intersect them from southwest to northeast, so that by alternately digressing from one of these directions to the other the irregular crest of the Pyrenees acquires its general direction, which from the Atlantic to the Mediterranean is 9° south of due east.

The north slopes of the Pyrenees are shorter and much steeper than those on the south or Spanish side. The Central, or High Pyrenees, extending about 150 miles, from Port de Canfranc to the valley of Aran, have the highest summits, including the Pic d'Enfer (10,109 feet), Balaitous (10,318), Vignemale (10,820), Mont Perdu (10,994), Pic des Posets (11,047), and Maladetta, or the Pic d'Anethou (11,168). The Eastern Pyrenees with three high summits (Pic Carlitte, Puigmal, and Canigou) maintain the heights with great uniformity and finally descend with great suddenness to the sea at the eastern extremity. The Western Pyrenees, on the other hand, have a gradually diminishing slope westward from Pic du Midi d'Ossau (9465 feet), so that near the Bay of Biscay the elevations are less than 3000 feet. The snow line, ranging from 8800 to 9200 feet, is nearly 1000 feet higher than in the Alps, while the general level of the mountains is considerably lower. Most of the highest summits are on the boundary crest, but the culminating point of the Maladetta is in Spain. The extent of the snow fields and glaciers is therefore insignificant as compared with that of the Alps. The entire area of glaciers is estimated at 13 square miles, confined almost altogether to the north slopes of the Central Pyrenees, the largest glaciers being on the Maladetta (1760 acres) and on the Mont Perdu group (1472 acres). Along the north slope of the Pyrenees are a number of famous watering places, including Bagnères-de-Bigorre and Bagnères-de-Luchon. The little Republic of Andorra (q.v.) lies among the Eastern Pyrenees on the south slope.

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PYRÉNÉES, pē̇′rȧ′nȧ′, BASSES. A southwestern department of France. See BASSES-PYRÉNÉES.

PYRÉNÉES, HAUTES. A southwestern frontier department of France. See HAUTES-PYRÉNÉES.

PYR′ENEES, PEACE OF THE. A treaty of peace concluded between France and Spain, Nov. 7, 1659, on an island in the Bidassoa River. It brought to an end the struggle between the two powers, which with intervals of peace had continued since the beginning of the sixteenth century, when Louis XII of France and Ferdinand the Catholic entered into the contest for supremacy in Italy. Spain ceded to France most of Artois and parts of Flanders, Hainault, and Luxemburg; in the south it surrendered Roussillon and a part of Cerdagne, thus making the Pyrenees the boundaries between the two countries. The Infanta Maria Theresa was promised in marriage to the young Louis XIV (q.v.).

PYRÉNÉES-ORIENTALES, pē̇′rȧ′nȧ′-zō̇′rē̇-äɴ′tȧl′. A maritime department of South France (Map: France, S., G 6). Area, 1598 square miles. The department presents a series of three parallel valleys formed by spurs from the Pyrenees, which run east and west and are watered by the Agly, the Tet (the principal river), and the Tech. The southwest corner is drained by the Sègre (Segura), a tributary of the Ebro. An extensive plain occupies all the north and east of the department. The climate is equable. The vegetable products include fine grain and some of the choicest fruits. Wines constitute the wealth of the district and include the red wines of Roussillon and the white muscatel of Rivesaltes. The chief exports are wine, cocoons, live stock, animal products, anchovies, etc. Capital, Perpignan (q.v.). Pop., 1901, 212,121; 1911, 212,986.

PYRE′NOID (from Gk. *πυρήν*, *pyrēn*, stone of a fruit + *εἶδος*, *eidos*, form). A differentiated portion of a chromoplast (q.v.) of proteid nature, which, since starch grains are usually formed around it, is sometimes called an amylum body. It is regarded as a food reserve.

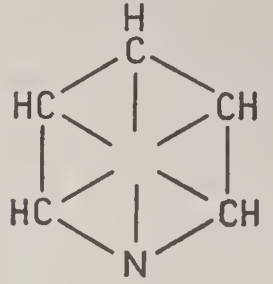
PYRETHRUM, pĭr′ĕth-rŭm. See INSECT POWDER, and Colored Plate of CHRYSANTHEMUMS.

PYR′GOS. A town of Greece, capital of the Nomarchy of Eleia. It is situated near the west coast of the Morea, 40 miles southwest of Patras, in a fertile region producing great quantities of currants, grapes, and oranges (Map: Greece, C 4). These products are exported through the port of Katakolon, with which the town is connected by a short railroad. Exports of currants attain 2,000,000 tons annually. Railroads also run to Patras and to the ruins of Olympia. The town is built on the site of ancient Letrinoi, a station on the road connecting Elis to Olympia. Pop., 13,690.

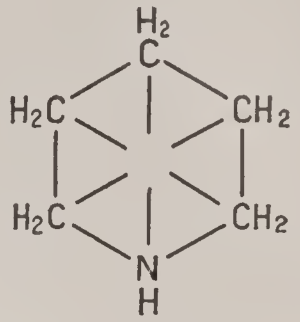
PYRGOTELES, pēr-gŏt′ē̇-lēz. See CAMEO.

PYRHE′LIOM′ETER (from Gk. *πῦρ*, *pyr*, fire + *ἥλιος*, *hēlios*, sun + *μέτρον*, *metron*, measure). The name given by Pouillet to an instrument devised by him for the purpose of measuring the amount of heat received from the sun in a unit of time by a unit surface. This quantity increased by the amount of heat lost while the solar radiation is passing through any part of the earth's atmosphere is sometimes called the "solar thermal constant," and all apparatus expressly designed to measure the intensity of radiant heat may properly be called pyrheliometers; but as the solar radiation may produce either thermal, optical, or chemical effects, according to the nature of the substance upon which it falls, the pyrheliometer is really a special form of actinometer (q.v.) or radiometer. Pouillet's instrument, devised in 1837, "consists of a thermometer whose bulb is inclosed in a thin flat metallic box filled with water. The upper surface of the box carefully blackened is placed perpendicularly to the rays of the sun. The heating of the thermometer during five minutes' exposure to the solar action is noted, and also its cooling during five minutes when the sunlight is cut off by a screen. The elevation of temperature produced by the heat of the sun in five minutes, corrected for the effect of cooling or warming when the sun's rays are cut off, is to be divided by the mass of the water in the apparatus and the area of the surface; this gives the quantity of heat expressed in calories as received by a unit surface in a unit time." In 1885 Prof. Knut Ångström devised his differential pyrheliometer, composed of two identical disks of copper, each carrying a thermoelectric junction and exposed alternately to the action of the sun, a galvanometer placed in the circuit of the two junctions measuring their difference of temperature; and in 1893 he brought out his compensating pyrheliometer. "Two thin strips of blackened metal identical in every way are placed side by side. One of these is exposed to the rays of the sun, while the other is kept in the shade; the latter is warmed up by an electric current until its temperature is identical with that of the strip that is warmed by the sunshine. Therefore at this moment the thermal effect of the solar radiation per unit of time is equal to that of the electric current." In 1893 Chwolson constructed a pyrheliometer consisting essentially of two thin plates gilded on the back and blackened in front, alternately exposed to and shielded from sunshine, and whose differences of temperature can be measured many times in rapid succession by thermoelectric methods. Chwolson's apparatus has been adopted by the Russian meteorological service, while Ångström's apparatus has commended itself to the Weather Bureau of the United States. Crova's mercury pyrheliometer consists of a mercurial thermometer bulb carefully blackened and receiving the solar rays through a narrow aperture of known area. The bulb is alternately shaded and exposed several times in succession, and the differences between the readings give the correct effect of the sunshine. When the bulb has been properly calibrated and its water equivalent is known, its changes of temperature can be converted into calories and the instrument becomes an absolute actinometer. The Weather Bureau uses also a form of pyrheliometer developed by Prof. C. F. Marvin, in which the pyrheliometer is mounted equatorially and caused to follow automatically the sun. A mechanically operated shutter exposes the blackened silver block to the sun for exactly one minute and shades the block the next minute and so on. The heating and cooling of the silver block thus exposed is accurately and very conveniently measured by an electrical resistance thermometer embedded in the silver block. The results of prolonged investigations by C. G. Abbot lead him to place the value of the solar thermal constant at the mean distance of the earth from the sun at 1.933 calories per minute per square centimeter, but in general such figures are affected by an uncertainty as to the exact absorption by the earth's atmosphere. A very complete review of pyrheliometers is given in the report on radiation by Jules Violle, published in the report of the meeting at St. Petersburg, 1899, of the International Meteorological Committee. The latest results, including those secured by a pyrheliometer sent into the atmosphere to an altitude of over 18,000 meters on July 11, 1914, are presented by C. G. Abbot in *Smithsonian Institution, Miscellaneous Collections*, vol. lxv, no. 4 (Washington, 1915).

PYR′IDINE, C_5H_5N. A basic compound of carbon, hydrogen, and nitrogen. It is usually prepared on a commercial scale from coal tar; it combines with the sulphuric acid used in purifying the coal-tar hydrocarbons, and when the acid is neutralized with soda, a mixture of pyridine and several other bases (notably quinoline) separates out in the free state; from this mixture pyridine is isolated by fractional distillation, and it may then be obtained pure by transforming it into one of its salts and purifying the latter by repeated crystallizations. Pure pyridine is a colorless liquid that boils at 115° C. (239° F.) and may be identified by its peculiar odor. The derivatives of pyridine include many of the alkaloids (q.v.); nicotine, e.g., is closely allied to it, and when subjected to a process of oxidation yields nicotinic acid, $C_6H_4N.COOH$, a compound evidently derived from pyridine by substituting a carboxyl group (COOH) for one of its hydrogen atoms. Another important derivative of pyridine is *piperidine*, $C_5H_{10}NH$, a colorless, powerfully basic liquid that boils at 106° C. (222.8° F.) and may be identified by its pepper-like odor. Piperidine may be obtained, on the one hand, from pyridine, by the action of nascent hydrogen; on the other hand, it may be prepared from the alkaloid piperine (q.v.), a characteristic constituent of pepper, by the action of caustic potash. The chemical constitution of pyridine and of piperidine is represented, respectively, by the following graphic formulæ:



PYRIDINE.



PIPERIDINE.

See Alkaloids.

PY′RITE (Lat. *pyrites*, from Gk. *πυρίτης*, flint, millstone, relating to fire, from *πῦρ*, *pyr*, fire). An iron disulphide (FeS_2) that crystallizes in the isometric system, has a metallic lustre, and is of a brass-yellow color. It is widely disseminated, occurring in rocks of all kinds and of all ages, sometimes in the form of grains disseminated throughout the mass of a rock or along the line of contact between basic eruptives and sedimentaries; as irregular and sporadic and concretionary masses in sedimentary rocks and modern sands and gravels; in the form of true fissure veins; and as interbedded, often lenticular masses, sometimes of immense size, lying conformably with the stratification of the inclosed rock. The origin of the mineral in the older crystalline rocks is frequently somewhat obscure, but in sedimentary rocks it is regarded as due to the precipitation of the included ferruginous matter by sulphureted and deoxidizing solutions produced by decomposing animal and vegetable matter. When found on the surface the mineral is often considerably altered by oxidation and hydration, forming limonite. The amount produced in the United States in 1913 was 341,338 long tons, valued at $1,286,284. The mineral finds its principal use in the manufacture of sulphuric acid and ferrous sulphate (green vitriol). Small quantities are used in the manufacture of vermilion paints, and some varieties of pyrite have been cut into squares, ovals, and other shapes for use as settings for rings, scarf pins, charms, trinkets, etc. Owing to its yellow color, pyrite has been frequently called *fool's gold*. See Copper.

PYRKER VON FELSÖ EÖR, pẽ̇r′kẽr fŏ̇n fĕl′shẽ ȧ′ẽr, Johann Ladislaus (1772–1847). An Austro-Hungarian cleric and poet. He was born at Lángh, Hungary, studied at Stuhlweissenburg, and entered a Cistercian cloister at Lilienfeld. He was made Archbishop of Erlau in 1827. His poetry, mostly ambitious epic, full of patriotism and piety, comprises: *Tunisias* (1819; 3d ed., 1826), in 12 cantos; *Rudolf von Habsburg* (1824; complete, 1827); *Perlen der heiligen Vorzeit* (1821); *Legenden der Heiligen* (1842); *Bilder aus dem Leben Jesu und der Apostel* (1843). Of more significance are his lyrics, *Lieder der Sehnsucht nach den Alpen* (1845). Pyrker's collected works (3 vols.) appeared in 1853–56.

PYRMONT, pẽ̇r′mŏnt. A small town in the Principality of Waldeck, west Germany, 15 miles northeast of Detmold. It is celebrated for its mineral springs, which were formerly among the most famous in Europe and are still visited by an average of 18,000 patients annually. Permanent population, 1900, 1483; 1910, 1705.

PYRMONT. A former principality of Germany, united with Waldeck (q.v.).

PYROG′RAPHY (from Gk. πῦρ, *pyr*, fire + -γραφία, *-graphia*, from γράφειν, *graphein*, to write). The process of burning a design on wood, leather, or other substances, by means of a hollow needle, which is heated over a spirit lamp and kept hot by blowing through it with a rubber ball gas generated by benzine. The needle is guided by the hand like a pencil, and according to its temperature, which is easily regulated, burns more or less deep and dark lines. Pyrography is often combined with painting and relief.

PYR′OLIG′NEOUS ACID. See Acetic Acid.

PY′ROLITE. See Explosives.

PY′ROLU′SITE (from Gk. πῦρ, *pyr*, fire + λοῦσις, *lousis*, bath, from λούειν, *louein*, to wash). A mineral manganese dioxide that crystallizes in the orthorhombic system, has a metallic lustre, and is of a dark iron-black or steel-gray color. Manganese oxides are believed to have been formed from the decomposition of preexisting manganiferous silicate constituents of the older crystalline rocks and the subsequent decomposition of the oxides in secondary strata. Pyrolusite is the common ore of manganese and is extensively worked for that product, being used in the manufacture of alloys, such as ferromanganese and manganese bronze; as an oxidizing agent, in the manufacture of chlorine and oxygen; and as a coloring material in the manufacture of glass, pottery, and paints.

PY′ROMA′NIA (Neo-Lat., from Gk. πῦρ, *pyr*, fire + μανία, *mania*, madness). A variety of impulsive obsession occurring without clouding of consciousness or disorder of judgment in a psychasthenic and thus a borderland state. In the old nomenclature it was classed with the degenerative insanities, i.e., the insanities depending upon an hereditary or acquired constitutional condition. It is therefore a psychoneurosis, caused by what Janet calls a lowering of the psychological tension. During certain periods the patient manifests an uncontrollable desire to commit arson and feels relief and pleasurable sensation when watching flames. Between these attacks he is sublucid. The patient is capable of attending to his affairs, perhaps, but is nervous or hysterical and evinces morbid irritability. Attacks of pyromania are usually sudden, though sometimes preceded by brief depression. The patient has full insight into the morbid character of his mental condition. But the impulse or imperative conception is strong, and the patient obeys. The morbid impulse to incendiarism occurs not infrequently in epileptics and menstruating girls, rarely in pregnant and hysterical women. See Dipsomania; Insanity; Kleptomania.

PYROM′ETER (from Gk. πῦρ, *pyr*, fire + μέτρον, *metron*, measure). An instrument used for measuring temperatures above the range of the ordinary mercury thermometer. One of the first pyrometers was that invented by Musschenbroek about 1725 and consisted of a metallic bar which expanded upon heating. Wedgwood (1782) made for his personal use in the pottery industry a pyrometer which depended upon the amount of permanent contraction of clay cylinders when heated to very high temperatures. Daniell (1821) devised a pyrometer which made use of the relative expansion of a metal bar and a tube of earthenware. The crude pyrometer of Wedgwood, however, served for nearly a century, and it is only in comparatively recent years that pyrometry has been placed upon a scientific basis. The normal or ideal standard temperature scale is the thermodynamic scale based upon the second law of thermodynamics. This is experimentally realized, with certain extremely small corrections, by the gas thermometer, which in the temperature range 100° C. to 1600° C. makes use of the expansion of nitrogen contained in a bulb of an alloy, 80 per cent platinum and 20 per cent rhodium. Higher temperatures are based on the extrapolation of the Wien-Planck or Stefan-Boltzmann radiation laws.

Experiment has established a number of fixed temperature points, such as the melting points of zinc (419.3° C.), antimony (630° C.), copper (1083° C.), platinum (1755° C.). The calibration of all pyrometers is ultimately based upon these and other experimentally determined fixed points. The following types of pyrometer are in extensive use: 1. *Mercury in glass thermometers.* Although mercury boils at 357° C. under atmospheric pressure, by filling the space above the mercury with carbon dioxide or nitrogen under pressure and employing a high-grade combustion glass tubing for the bulb and stem, mercury in glass thermometers may be used to 560° C. 2. *Calorimetric pyrometers* utilize the total heat of metals such as nickel. A nickel block is placed in the furnace of which the temperature is desired and when thoroughly heated is removed and dropped into a vessel of water. The rise in temperature of the water is a measure of the temperature of the furnace. 3. *Fusible cones* (Seger), used in potteries, are small cones of clay with compositions so arranged that their melting points differ in steps of about 20°. If it is desired to heat the furnace to a given temperature, the cone corresponding to this temperature is placed in the furnace and the heat applied until the cone softens and bends over. 4. *Veritas firing rings,* used in potteries, depend upon the permanent shrinkage of certain clay rings when exposed to heat. The diameters of the rings are measured before and after heating. 5. *Thermocouples.* Temperatures are measured by the magnitude of the electromotive forces set up between wires of different materials when one junction is exposed to the temperature to be measured and the other junctions are kept at some known temperature. In the LeChatelier couple one wire is of platinum and the other of an alloy 90 per cent platinum and 10 per cent rhodium. This couple may be operated up to 1600° C. For temperatures below 1000° C. base-metal couples are frequently used on account of inexpensiveness, the usual metals being iron, copper, copper alloys, and nickel alloys. 6. *Resistance thermometers.* This method of high-temperature measurement ordinarily makes use of the variation in the electrical resistance of platinum. In one of its simplest forms the pyrometer consists of a coil of platinum wire wound on a mica frame and incased in a protecting tube of porcelain. 7. *Optical pyrometers* may be used for any temperature above 600° C. This type of instrument is based upon the photometric principle of matching the intensity of the radiation, usually of one color such as red, emitted by a glowing material with that of the same color from a standard lamp. The brightness of a source increases very rapidly with the temperature, and hence this method is capable of high accuracy. Moreover, this form of pyrometer is not placed in the furnace, but is operated at a distance of several feet and hence does not deteriorate rapidly with use. This and the radiation pyrometer are the only instruments which permit the measurement of extremely high temperatures, such as that of the electric arc (3500° C.), or of the sun (6000° C.). 8. *Radiation pyrometers* make use of the heat radiated by a glowing material. This heat falls upon the receiver of the pyrometer, and the resulting small rise in temperature of the receiver is measured by a thermocouple or by the expansion of a bimetallic spring mounted within the receiver.

Recording pyrometers.—The thermoelectric, resistance, and radiation pyrometer may be made self-recording, so that a printed record of the temperature of the furnace may be obtained. Recorders or indicating instruments for these pyrometers may be located several hundred feet from the furnace of which they are registering the temperature. Consult: Waidner and Burgess, "Optical Pyrometry," and Burgess and Foote, "Radiation Pyrometry," in United States Bureau of Standards, *Scientific Papers*, Nos. 11, 250 (Washington, 1904, 1915); C. R. Darling, *Pyrometry* (New York, 1911); and Burgess and LeChatelier, *The Measurement of High Temperatures* (3d ed., ib., 1912). See RADIATION; THERMOMETER; THERMOMETRY.

PYR'OMOR'PHITE (from Gk. πῦρ, *pyr*, fire + μορφή, *morphē*, form). A mineral lead phosphate and chloride that crystallizes in the hexagonal system, has a resinous lustre, and in color is of various shades of green, yellow, and brown. It occurs with lead ores, usually in veins.

PY'RONOME. See EXPLOSIVES.

PY'ROPE. See GARNET.

PYROPH'ORUS (Neo-Lat., from Gk. πυροφόρος, fire bearing, from πῦρ, *pyr*, fire + -φόρος, -*phoros*, bearing, from φέρειν, *pherein*, to bear). Any solid substance which is capable of taking fire on exposure to the air at ordinary or but slightly elevated temperatures. This property is possessed chiefly by finely divided solid bodies, such as metallic iron or nickel, reduced from the oxide by heating in hydrogen. The spontaneous inflammability in such cases is explained by the capacity of the powders for rapidly condensing air within their pores, thereby causing a considerable rise of temperature, while at the same time they present a large surface to the action of oxygen. The substances possessing this property include numerous salts, such as lead citrate or tartrate, which after ignition in a glass tube until gaseous matter is no longer evolved and then being left to cool take fire instantly on being thrown out into the air. "Homberg's pyrophorus" is obtained by heating alum with lampblack or similar carbonaceous matter.

PY'ROPHOSPHOR'IC ACID. See PHOSPHORIC ACID.

PY'ROPHYL'LITE (from Gk. πῦρ, *pyr*, fire + φύλλον, *phyllon*, leaf). A hydrous aluminium silicate that is believed to crystallize in the monoclinic system, although it is not usually found in distinct crystals. It has a pearly lustre and in color ranges from white, through various shades of yellow, to green. It has a soapy or greasy feeling that suggests its similarity to various forms of talc, which it closely resembles. It occurs in some of the older rocks. It is used for the manufacture of slate pencils, the variety employed for this purpose being known as "pencil stone." It is further used for making tailors' chalk (French chalk). The compact varieties, which are known as *agalmatolite*, or *pinite*, have been extensively used by the Chinese and Japanese in the manufacture of small images and objects of art.

PYRO'SIS (Neo-Lat., from Gk. πύρωσις, a burning, from πυροῦν, *pyroun*, to burn, from πῦρ, *pyr*, fire), or WATER BRASH. A symptom of certain forms of indigestion in which at intervals a regurgitation of a considerable quantity of a watery acrid or acid fluid occurs, usually accompanied by a burning sensation in the epigastrium, frequently extending up behind the sternum to the throat. In common parlance the regurgitation is called water brash, and the sensation is heartburn. See DYSPEPSIA; INDIGESTION.

PY'ROSO'MA (Neo-Lat., from Gk. πῦρ, *pyr*, fire + σῶμα, *sōma*, body). A compound, pelagic, luminous tunicate. See ASCIDIAN; LUMINOSITY OF ANIMALS.

PYROTECHNY, pī'rō-těk'nĭ (from Gk. πῦρ, *pyr*, fire + τέχνη, *technē*, art). The art of making fireworks. The origin of pyrotechny is unknown, but the art was early practiced in the East and has attained the highest degree of perfection among the Chinese and Japanese. Although inflammable compositions, known as Greek fire, were used in European warfare before gunpowder had become known among the Western nations, fireworks, as now denominated, became known to them about the middle of the fourteenth century, and we find record of their having been used as an accessory of public pageantry in 1588. The early development of fireworks in Europe was due to the Florentines, and the Italians long retained their supremacy in this field.

The chief materials employed in the manufacture of fireworks are gunpowder or its constituents, charcoal, sulphur, and saltpetre, or other oxidizing salts; metals and metallic salts which on burning give rise to various-shaped sparks or a brilliant light, or which impart color to the flame; touch paper and fuse or quick match, by which the charges are ignited and inflamed; paper and wood from which to construct the cases and sticks; and resin, camphor, lycopodium, soaps, gum, lampblack, and similar bodies with which to modify the character of the reaction.

Roman Candles. In the Roman candle we have the stars or balls, made up of gunpowder ingredients mixed with color or light-giving materials compacted into hard masses by the aid of gum or shellac, resting on loosely confined layers of granulated gunpowder, interspersed between well-compacted masses of slow-burning composition, all inclosed in a stout paper or cardboard case. The stars are hollow and are provided with a piece of quick match by which they are ignited. The end of the case is primed with powder and capped with touch paper. When the latter is ignited the priming powder is inflamed and this sets fire to the composition, or dark fire as it is technically called, which slowly burns with the production of flame and sparks until the star is reached, when the grained gunpowder upon which it rests is ignited, burns rapidly, and expels the star with a loud report.

Rockets consist of a cylindrical paper or cardboard body, or fusee, filled with propelling composition, to the upper end of which is attached a shorter and wider paper tube called the pot, which contains the garniture, or material that produces the brilliant clusters of stars or showers of golden or colored rain, etc., which appear when the rocket has risen to a great height. The garniture is ignited by the flame which flashes through a hole in the clay plug at the top of the fusee as the rocket reaches its greatest altitude.

Pinwheels and other revolving pieces are constructed by coiling the paper case, when not too tightly filled with composition, about a flat wooden block or frame which in use is attached to a tree or board by a nail upon which it may freely revolve, the revolution being determined by the pressure of the gas evolved as the composition burns.

Touch Paper consists of a thin, rather tough paper which has been sponged with a weak solution of saltpetre until saturated and then dried.

Quick Match consists of cotton wick which has been saturated with a weak solution of saltpetre, then coated with a thick paste of gunpowder and gum, spread evenly over it, and then dried.

Colored Fire. In producing light and color, there are added to the gunpowder composition steel filings for brilliant fire or cast-iron filings for Chinese fire. Copper filings give a greenish tint to flame; zinc filings a fine blue color; powdered magnesium a dazzling white light; amber, colophony, or common salt affords yellow fire. Lampblack produces a very red color with gunpowder and a pink with nitre in excess, and it serves for making golden showers. Yellow sand or glistening mica communicates to fireworks golden radiations. Verdigris imparts a pale green; sulphate of copper and sal ammoniac a palm-tree green; barium salts a grass green; strontium salts crimson; calcium salts orange. Potassium picrate on burning produces a whistling sound and has recently been introduced for use in whistling bombs and rockets. Camphor yields a very white flame and aromatic fumes. Lycopodium burns with a rose color and a magnificent flame. The published recipes and formulas for the manufacture of the materials used in fireworks are very numerous, while each manufacturer has his special mixtures and methods of treatment.

Greek Fire (q.v.) is supposed by some to have been composed of asphaltum, nitre, and sulphur, by others to have had approximately the composition of gunpowder. A modern composition known by this name consists of a solution of phosphorus in carbon disulphide with or without sulphur, potassium chlorate, and mineral oil. Rockets, known as Congreve rockets, carrying explosive shells and incendiary compositions in the pot, were used in the siege of Boulogne in 1806 and in the British war with the Burmese. Bengal lights are used as distress signals at sea, while Roman candles, or similar devices throwing colored stars, are used, with a telegraphic code, for over-water communication.

Bibliography. Babington, *Pyrotechnia, or a Discourse of Artificial Fireworks* (London, 1635); D'Orval, *Traité des feux d'artifice pour le spectacle et pour la guerre* (Bern, 1750); Ruggieri, *Pyrotechnie militaire* (Paris, 1812); James Cutbush, *A System of Pyrotechny* (Philadelphia, 1825); F. M. Chertier, *Nouvelles recherches sur les feux d'artifice* (2d ed., Paris, 1854); Paul Tessier, *Chimie pyrotechnique* (ib., 1859); W. H. Browne, *The Art of Pyrotechny* (London, 1879); Cesare Sonzogno, *Il pirotecnico moderno* (Milan, 1892); R. Molina, *Les explosifs et leur fabrication* (Paris, 1908). See Explosives; Greek Fire; Gunpowder; Signaling and Telegraphing, Military; Signals, Marine.

PY'ROXENE (from Gk. πῦρ, *pyr*, fire + ξένος, *xenos*, guest), or Augite. A name applied to a group of mineral metasilicates, of which the mineral pyroxene is the type. The latter is a metasilicate of calcium and magnesium, often with iron, and sometimes with manganese, and zinc, that crystallizes in the monoclinic system, and is usually founded in prismatic crystals, although sometimes granular, coarse or fine. According to its composition the species is divided by Dana into the following subspecies: diopside, called also malacolite, or alalite, a calcium-magnesium pyroxene, whose color varies from pure white and yellowish or grayish white to green; hedenbergite, a calcium-iron pyroxene of a black color; schefferite, a manganese pyroxene sometimes containing iron, of a brownish color; and augite, an aluminium pyroxene sometimes containing small quantities of the alkalies, of a black color. These varieties are common minerals and are found in crystallized limestone and dolomite and frequently in the older rocks. Pyroxene is an essential constituent of many igneous or eruptive rocks, and with labradorite or anorthite and magnetite it forms basalt. The transparent green diopside variety is sometimes cut for a semiprecious stone.

PYROX'ENITE (from Gk. πῦρ, *pyr*, fire + ξένος, *xenos*, guest). An igneous rock of ultrabasic composition, free from feldspar and chiefly composed of one or more varieties of pyroxene or amphibole and sometimes magnetite or ilmenite. Pyroxenites easily suffer alteration from weathering, the principal products being talc (soapstone) and serpentine. They are closely allied to the peridotites. See Peridotite.

PY'ROXYL'IC SPIRIT. See Methyl Alcohol.

PYROX'YLIN (from Gk. πῦρ, *pyr*, fire + ξύλον, *xylon*, wood). A term originally broadly applied to the products obtained by the action of nitric acid, or a mixture of nitric and sulphuric acids, on wood, paper, cotton, and similar substances. It is now more specifically restricted to soluble cellulose nitrates and especially to collodion cotton. The United States Pharmacopœia designates it as a product obtained by the action of nitric and sulphuric acids on cotton and consisting chiefly of cellulose tetranitrate $[C_{12}H_{16}(ONO_2)_4O_6]$ which is slowly but completely soluble in 25 parts of a mixture of 3 volumes of ether and 1 volume of alcohol. It is soluble in acetone and glacial acetic acid and is precipitated from these solutions on addition of water. It is exceedingly inflammable and on burning should leave no weighable residue of mineral impurity. It is used for the manufacture of pharmaceutical and photographic collodions and of pyroxylin plastics. It should be stored in cartons protected from the light, for when kept in well-closed bottles and exposed to the light it is decomposed with the evolution of nitrous vapors. See Guncotton.

PYRRHIC (pĭr'ĭk) **DANCE** (Gk. ἡ Πυρρίχη, *hē Pyrrhichē*). The oldest and most famous of the ancient Greek war dances. Regarding its origin and name accounts varied. Some attributed it to a Cretan or Spartan named Pyrrhichos, others to Pyrrhos, son of Achilles, others to the Dioscuri or the Curetes. The Cretan name is said to have been πρύλις, *prylis*. There can be little doubt that the dance originated among the Dorians of Crete or Laconia, and it was especially cultivated by the Spartans as valuable training for the soldier. It seems to have been presented by a chorus of armed youths, who divided into two bands and represented, in pantomime, attack and defense, including the feints and the parries needed in individual contest. It was also danced as a solo, and sometimes by women, as is clear from Xenophon's account in the *Anabasis*, vi, 1, 12, and the testimony of the vases. At Athens it was cultivated by the Ephebi (see Ephebus), and was danced in the competitions of the Panathenæa (q.v.). In later times a Bacchic element was introduced and the adventures of Dionysus were depicted. In Rome it was very popular as a pantomimic spectacle. The time of the music is said to have been rapid (in Greek metre two short syllables (⏑ ⏑) are known as a Pyrrhic foot. This, however, occurs rarely, and is always to be measured as containing three metrical units, the smallest number which can form a foot). Consult White and Morgan, *An Illustrated Dictionary to Xenophon's Anabasis*, p. 193 (Boston, 1892), and the article "Pyrrhica," in W. Smith, *A Dictionary of Greek and Roman Antiquities*, vol. ii (3d ed., London, 1891).

PYRRHIC VICTORY. A phrase denoting a success won at a ruinous cost, referring to the battle of Asculum, in which Pyrrhus gained the victory over the Romans with such heavy losses that he is said to have exclaimed, "Another such victory and Pyrrhus is destroyed." See Cadmean Victory.

PYRRHO, pĭr′rō (Lat., from Gk. Πύρρων, *Pyrrhōn* (c.365–c.275 B.C.). A Greek philosopher, born in Elis, the founder of the Skeptical school of philosophy. (See Skepticism.) He was a painter in his youth, but later was attracted to philosophy by the works of Democritus and became the pupil of Bryson, a disciple of Stilpo. Afterward he attached himself to Anaxarchus and with him accompanied Alexander the Great on his expedition to the East, where, according to Diogenes Laertius, he became acquainted with the teachings of the Persian Magi and the Indian Gymnosophists. During much of his long life he lived in retirement. He was so highly esteemed by his fellow citizens that they made him their chief priest and honored him with a statue after his death; the Athenians gave him the rights of citizenship. As Pyrrho left no writings, little is certainly known of his doctrine; the chief source of information is the work of his follower, Timon the Sillographer. The main principle of his teaching seems to have been that to attain the highest good, happiness, we must know the nature of things and the relation we should bear to them. But since we know things only as they seem to us, their real nature cannot be definitely apprehended, and hence objective knowledge is impossible of attainment. Therefore the correct attitude for the philosopher is complete suspense of judgment, and in this lie freedom from trouble and peace, which is man's chief good. Consult: Waddington, *Pyrrhon et le Pyrrhonisme* (Paris, 1877); Eduard Zeller, *Philosophie der Griechen*, vol. iii (5th ed., Leipzig, 1892); J. E. Erdmann, *History of Philosophy*, English translation by W. S. Hough, vol. i (New York, 1892); Christ-Schmid, *Geschichte der griechischen Literatur*, vol. ii, part i (5th ed., Munich, 1911); Friedrich Ueberweg-Prächter, *Grundriss der Geschichte der Philosophie*, vol. i (10th ed., Berlin, 1914).

PYR′RHOTITE (from Gk. πυρρός, *pyrrhos*, reddish, from πῦρ, *pyr*, fire). A mineral iron sulphide, frequently containing nickel, that crystallizes in the hexagonal system, has a metallic lustre, and in color is bronze yellow to copper red. It occurs with magnetite and apatite, also with other sulphides in the older rocks, as well as sometimes in meteorites.

PYRRHUS, pĭr′rŭs. See Neoptolemus.

PYRRHUS (Lat., from Gk. Πυρρός) (c.318–272 B.C.). King of Epirus, son of Æacides and Phthia and a distant kinsman of Alexander the Great. According to one account he was a descendant of Neoptolemus (otherwise called Pyrrhus), son of Achilles. When Æacides was deposed by a faction of his people and driven from his Kingdom, Pyrrhus, who was then but an infant two years of age, was rescued by some faithful attendants of the King and carried to Glaucias, King of a tribe of the Illyrians. By him he was restored to his Kingdom when 12 years old, but in 302 was again driven out and took refuge with Demetrius Poliorcetes. After serving in the battle of Ipsus he went as a hostage for Demetrius to Egypt, where he married the stepdaughter of Ptolemy Soter. Thence returning to Epirus, he regained possession of his throne, and immediately directed his attention to the conquest of Macedonia. He obtained possession of the western part of that country and, when his former friend Demetrius became King, joined a coalition with several others to drive him out. He was successful, and in 287 B.C. the Kingdom was divided between Pyrrhus and Lysimachus. Pyrrhus reigned but a few months, however, and was then himself expelled in favor of Lysimachus.

In 281 B.C. the people of Tarentum, a Greek colony in lower Italy, then at war with the Romans, sent an embassy to Pyrrhus, in the name of all the Greek colonies in Italy, offering him the command of all their troops against their enemies. Taking up their cause, Pyrrhus in 280 B.C. arrived at Tarentum with 25,000 troops and 20 elephants. The first battle between Pyrrhus and the Romans, who were commanded by the consul, M. Valerius Lævinus, took place at the river Siris in Lucania. Only through the help of the elephants, whose strange appearance and gigantic size excited a sudden panic among the Romans, did Pyrrhus win the victory. See Pyrrhic Victory.

He now advanced into central Italy, on his way towards Rome, but, finding the city well defended, he withdrew to Tarentum and wintered there. In the following year (279 B.C.) he was victorious over the Romans at Asculum in Apulia, but lost so heavily that, unable to follow up his victory, he withdrew to Tarentum. Having been invited by the Greeks of Sicily to assist them in their struggles with the Carthaginians and the Mamertines (q.v.), Pyrrhus effected a truce with Rome (278) and crossed into Sicily. His first exploits in that island were both brilliant and successful, so that the

Carthaginians were confined to Lilybæum and the Mamertines to Messana. Then the Sicilians began to murmur at the burdens put upon them by Pyrrhus and to treat with the enemy, and in 276 B.C. Pyrrhus left the island and returned to Tarentum. On his way he fought the Carthaginian fleet off Syracuse and the Mamertine army near Rhegium. In the following year (275) he was completely defeated by Manius Curius Dentatus, near Beneventum, and in 274 he returned to Epirus, leaving Milo with a garrison at Tarentum. In 273 he once more invaded Macedonia, over which Antigonus Gonatas was King, and established himself a second time as ruler of that country. In 272, at the request of Cleonymus, the rightful but excluded King of Sparta, he led a force into the Peloponnesus. He attacked Sparta, but was repulsed, and then withdrew to Argos, to assist Aristeas, one of the leading citizens of the place, in his rivalries with Aristippus. Here he met Antigonus of Macedon, the champion of the opposite faction, and a fight took place in the streets of the city. Pyrrhus was thrown from his horse and stunned by a tile thrown from a housetop by the mother of the man whom he was about to kill, and was then killed by one of the soldiers of Antigonus. Consult the standard histories of Rome; also: J. G. Droysen, *Geschichte des Hellenismus* (2d ed., Gotha, 1877–78); Rudolf Schubert, *Geschichte des Pyrrhus* (Königsberg, 1894); J. P. Mahaffy, *Alexander's Empire* (New York, 1898); Carl Klotzsch, *Epirotische Geschichte bis zum Jahre 280 vor Christus* (Berlin, 1911).

PY'RUS (variant spelling of Lat. *pirus*, pear). A genus of trees and shrubs of the family Rosaceæ, to which belong some of the most valuable fruits and ornamental trees and shrubs of temperate climates, having a five-celled fruit called a pome with a cartilaginous endocarp and two seeds in each cell. It includes species differing very much in appearance, in foliage, and in almost everything except the character of the flower and fruit. Some botanists separate the apples (*Pyrus malus*) as a distinct genus. See APPLE; BEAM TREE; PEAR; ROWAN TREE.

PYTHAG'ORAS (Lat., from Gk. Πυθαγόρας). A famous Greek philosopher and geometer, born at Samos, probably in the forty-ninth Olympiad (584–581 B.C.). He was the son of Mnesarchus and is said to have been the pupil of Pherecydes. He had become known in Ionia as a man of great learning when, perhaps driven from home by disgust at the tyranny of Polycrates about 530 B.C., he migrated to Magna Græcia and settled at Crotona. Here he founded an exclusive brotherhood among the aristocracy of the place. The fame of it spread abroad and attracted into its circle men and women not only from other neighboring colonies, but from all parts of south Italy. The original purpose of this brotherhood was probably religious and not political, and yet the society became involved in the fierce struggles between the aristocracy and the democracy that were at this time raging in lower Italy; and when the popular party gained the upper hand, in its wild fury it turned upon the Pythagorean brothers and burned them in their meeting places. Only a few escaped. It is not certain whether Pythagoras himself perished in this outbreak or whether he had previously died peacefully in Metapontum, whither he is said to have retired when the storm was gathering. He is said to have traveled from Persia to Gaul in search of wisdom, to have become initiated in Egypt into the venerable mysteries of that country, and there to have acquired mathematical lore and a belief in the transmigration of souls. He is even reported to have been the son of Hermes in a previous metempsychosis and to have been permitted to bring with him into his earthly life the memory of all his past experiences, and he is credited with all sorts of miraculous performances.

The exact character of his own personal teachings is a matter of dispute. His name is mentioned only three times in the whole Aristotelian corpus; both Plato and Aristotle speak frequently of Pythagoreans; they evidently knew nothing definite of the views actually promulgated by Pythagoras himself. The main reason for this ignorance is to be found in the fact that Pythagoras committed nothing to writing, and every disciple strove to gain credit for his own phase of Pythagoreanism by attributing it to the venerated master, whose *ipse dixit* carried so much weight.

It seems reasonable, in the light of all we know, to suppose that the early Pythagorean brotherhood was one of the mystic circles, numerous at that time, founded with a view of purifying its members from some imaginary guilt and accomplishing this end by the observance of taboo. Among the *akousmata*, or exoteric teachings of the later Pythagoreans, we find such prohibitions as these: not to sit on a quart measure; not to step across the beam of a balance; not to eat beans or the heart of animals; not to stir fire with iron; not to look in a mirror beside a light. All these punctilios point almost unmistakably to primitive magic. As Burnet remarks, we find in such practices, so senseless to the outsider, an explanation of the popular outburst against the society. The domination of such a religious order ruling the state must have been galling enough. "Greek democracies could never pardon the introduction of new gods. . . . This introduced, as it were, an unknown and incalculable element into the arrangements of the state, which might very likely be hostile to the democracy, and was in any case a standing menace to the mass of citizens, who had no means of propitiating the intruding divinity."

But although the main motive of the brotherhood was thus superstitious, there is no doubt that a certain philosophic doctrine was taught to the brethren by its learned founder. Like all the early Greek philosophies, it was probably cosmological, and it was likewise dualistic. "The two primary opposites, the Limited and the Unlimited, were brought together in a 'harmony' which could be numerically determined." (Burnet.) The Unlimited was space, the Limited was the definite forms in which space manifested itself. Space was not regarded as an abstract entity; it was rather a material sensible thing, probably identified with air. Hence the universe was said to breathe. The unlimited air is in its essence dark; the principle of limitation is fire, the bright element which reveals definite spatial outlines.

How much mathematics Pythagoras knew is likewise uncertain. To him with little question is to be ascribed the first proof of the theorem known to the Egyptian "rope stretchers" concerning the right-angled triangle (see Hypotenuse), which they knew in the case of the triangle with sides 3, 4, 5, without giving a rigorous proof. Of other matters, what is to be ascribed to Pythagoras himself and what to his pupils it is difficult to decide. Therefore we generally speak of a mathematical truth as being discovered by the Pythagoreans rather than by Pythagoras. See Pythagoreanism.

Bibliography. Friedrich Ueberweg, *History of Philosophy from Thales to the Present Time*, translated by G. S. Morris (2 vols., New York, 1884); James Gow, *Short History of Greek Mathematics* (ib., 1884); Leopold von Schroeder, *Pythagoras und die Inder* (Leipzig, 1884); Ritter and Preller, *Historia Philosophiæ Græcæ* (7th ed., Gotha, 1888); Eduard Zeller, *Die Philosophie der Griechen in ihrer geschichtlichen Entwicklungen* (5th ed., Leipzig, 1892; Eng. trans. of 4th Ger. ed. by S. F. Alleyne, 2 vols., London, 1881); Wilhelm Bauer, *Die ältere Pythagoreismus: Eine kritische Studie* (Bern, 1897); Wilhelm Windelband, *History of Ancient Philosophy* (Eng. trans. by H. E. Cushman, New York, 1899); Karl Fink, *Brief History of Mathematics*, translated by Beman and Smith (Chicago, 1900); Moritz Cantor, *Vorlesungen über Geschichte der Mathematik* (Leipzig, 1900); Theodor Gomperz, *Greek Thinkers* (London, 1901–05); John Burnet, *Early Greek Philosophy* (2d ed., ib., 1908); id., *Greek Philosophy* (ib., 1914).

PYTHAGORAS OF RHE′GIUM. A famous Greek sculptor of the first half of the fifth century B.C. He is commonly called a Rhegian, but on a pedestal at Olympia bearing his signature he calls himself a Samian, and it is probable that he was one of the emigrants from Asia Minor to Magna Græcia about 496 B.C. He belongs to the period of transition from the archaic art to the great masters of the time of Phidias. (See Greek Art.) He was especially celebrated for his statues of athletes and, we are told, introduced symmetry and rhythm into sculpture. This seems to refer to the careful adjustment of the harmony between the parts by a study of proportions and to the endeavor to secure graceful and flowing lines removed from the stiffness and schematic treatment of the archaic school. He also was said to have been the first to render the hair, veins, and muscles in a natural manner. His importance was evidently great in the development of Greek art, but none of his works can be identified with certainty. Consult: Sir Charles Waldstein, *Essays on the Art of Phidias* (New York, 1885); Maxime Collignon, *Histoire de la Sculpture grecque* (2 vols., Paris, 1892–96); Henri Lechat, *Pythagoras de Rhégion* (Lyons, 1905); E. A. Gardner, *A Handbook of Greek Sculpture* (London, 1911).

PYTHAG′ORE′ANISM. The philosophical system advocated by the followers of Pythagoras. No point in Greek philosophy is more disputed than the proper interpretation of Pythagoreanism. The probability is that there was no one single consistent theory accepted by all Pythagoreans, but that each of these theories was held by some one or more of their number. The real question is not what Pythagoreans taught, but what was the earliest statement of philosophical problems given by accredited Pythagoreans. Even this question cannot be answered with assurance, as far as the fundamental principle of the system is concerned. Pythagoras himself probably gave no clear expression of philosophical opinion, because he was not so much interested in philosophical theory as in religious and moral reform. See Pythagoras.

Philolaus, a contemporary of Socrates and Democritus, was probably the first distinctively philosophical Pythagorean, but unfortunately we have only fragments of his works, and even they are of doubtful authenticity. Nor is the witness of Plato and Aristotle to his teachings wholly unambiguous. It is probable that Philolaus started from geometrical facts and the phenomena of sounds presented by the strings of the heptachord and that he held an atomistic view of the constitution of the world. The ultimate units of reality were considered to be perceptible spatial points of material character. Two such points made a line, three made a surface, and four made a solid. By number he did not mean an abstraction, but the concrete quantum of such points. The smallest constituent parts of the earth were considered cubical, those of fire tetrahedral, those of water icosahedral, while those of "the fifth element which embraces all the others" were dodecahedral. But the Pythagoreans went further and gave quantitative values to things immaterial, which were thus construed in a material way. The soul was correlated in some way with the number six; reason, health, and light with seven; love, friendship, and prudence with eight. Such phantasy is the result of an attempt to reduce all reality to terms found satisfactory in explaining sensible reality. Along with this curious fiction went a mystical significance of numbers. The Pythagoreans were fond also of arranging things by opposites and finding 10 such pairs.

The Pythagorean cosmology is interesting, as it was a guess that came so near the truth concerning the solar system. Much of it was fanciful, but in spite of these vagaries it is interesting to note the fact that Pythagoreanism taught that the earth is a sphere revolving around a central fire. The central fire, however, was not the sun, but an invisible object, because towards it the farther side of the earth is always turned. The sun and stars shine by light reflected from this self-luminous centre. The heaven of the fixed stars, the sun, the moon, the five then known planets, and the earth made only nine objects; hence to fill out the perfect number of ten a counterearth was invented. Solar eclipses were due to the intervention of the earth between the central fire and the sun; lunar eclipses to the invervention of some heavenly body, sometimes the countersun, between the central fire and the moon. "They assumed that from the revolution of the spheres there resulted a melodious musical sound, the so-called harmony of the spheres." (Windelband.) Following Pythagoras, the Pythagoreans accepted the doctrine of metempsychosis, or transmigration of souls; but the doctrine of the world soul, sometimes ascribed to the Pythagoreans, was probably not a part of their system.

The Pythagoreans laid much emphasis on music, as can be seen from their doctrine of the music of the spheres and from their insistence on the all-importance of harmony. But besides the discovery of the relation between the length of the strings of the lyre and the tones emitted, they did not contribute much to the theory of music.

While geometry was founded by the Ionic school, the main progress made in it was due to the Pythagorean school in Italy. The Pythagoreans were the first to give the rigorous proofs now demanded and to use mathematics in a specialized meaning. To Pythagoras himself is probably due the first rigorous proof of the proposition known by his name (Euclid, i, 47; see Hypotenuse). The school was concerned chiefly with the questions "how many" and "how great," i.e., with number and magnitude, and the Pythagorean geometry is mostly concerned with those relations of areas, volumes, and lines which admit of arithmetical expression. Geometry was to them a means for investigation in the theory of numbers. Expressions like plane and solid numbers used for the contents of spatial magnitudes of two and three dimensions also serve to indicate the constant tendency to objectify arithmetical thought by means of geometry. The knowledge of the Pythagoreans in the field of elementary series was quite comprehensive (see Series), and the three proportions, arithmetical, geometrical, and harmonical, were known to them. The so-called most perfect or musical proportion, e.g., $6 : 8 = 9 : 12$, was invented by the Babylonians and is said to have been first brought to Greece by Pythagoras. By improvement in definition, by systematization, and by the use of deduction the study of geometry at the hands of the Pythagoreans was made a factor of liberal education. For bibliography, see Pythagoras.

PYTHAGOREAN PROPOSITION. See Hypotenuse; Pythagoras.

PYTH'EAS (Lat., from Gk. Πυθέας). A Greek navigator, born at Massilia (Marseilles) in the fourth century B.C. He is said to have sailed around the west coast of Europe and through the English Channel to Thule, the most northern land known to the ancients, perhaps Mainland, the largest of the Shetland Islands. Nothing is accurately known about his life. He gave an account of his first voyage in his *Description of the Ocean*, in which he stated that he traveled through Britain and that its circumference was over 40,000 stadia. The island of Thule, he said, had neither air nor land nor sea, but a composition of all of them, in which the whole universe was suspended. This substance, which could not be penetrated by land or sea, he had himself seen and was told that it was "a connecting link of the universe." He puts Thule six days' sail from Britain. He says that the sun never sets during the summer solstice in Thule. On a second voyage he skirted the shore of Europe, from Cadiz to a river which he called Tanais. This may have been the Elbe, which he may have confused with the Don, the classical name of which was Tanais. He was also a mathematician and astronomer and was the first to determine the meridian altitude of the sun at the summer solstice by the use of a gnomon. The fragments of his writings were collected and published by Arvedson at Upsala in 1824, and by Fuhr, *De Pythea Massiliensi* (Darmstadt, 1835). Polybius and Strabo speak of him contemptuously, but modern geographers are more favorable in their judgment. It is supposed that he was sent out by the Massilians for the purpose of increasing their commercial connections. Consult: E. H. Bunbury, *History of Ancient Geography* (London, 1883); H. F. Tozer, *History of Ancient Geography* (Cambridge, 1897); H. Berger, *Geschichte der wissenschaftlichen Erdkunde der griechen*, part iii (2d ed., Leipzig, 1903); Christ-Schmid, *Geschichte der griechischen Literatur*, vol. i, part i (6th ed., Munich, 1912).

PYTH'IA (Lat., from Gk. Πυθία). The priestess of Apollo at Delphi. See Delphi.

PYTHIAN (pĭth'ĭ-*a*n) **GAMES** (Lat. *Pythia*, from Gk. Πυθία). The second of the four great national festivals of the Greeks, held in the Crissæan Plain, near Delphi. (See Games, Ancient.) Their origin was attributed to Apollo, in celebration of his destruction of the dragon Python. At first they were held under the superintendence of the priests of Delphi every ninth year and consisted solely of a musical contest between singers, accompanied by the cithara. After the first Sacred War the character of the festival was changed, and the Amphictyons assumed charge. (See Amphictyonic Council.) The first of the new series was held in 586 B.C., but it was not till the second celebration in 582 B.C. that the laurel wreath was given as a prize, and from this date the Pythian series was reckoned. They were from this time held in the summer of the third year of each Olympiad, probably in August, and seem usually to have occupied four days. The first day was devoted to the musical contests, which always held the chief place. Among them the most important was the Pythian Nomos, a solo on the double flute, which represented the victory of Apollo over the dragon. On the second day came athletic games, much like those at Olympia (q.v.), and on the third the horse racing. The latter contests were held in the Crissæan plain. On the fourth day seem to have come the festival procession and sacrifices. The musical contests were increased in later times; even poets and historians competed. Consult: J. H. Krause, *Die Pythien, Nemeen und Isthmien* (Leipzig, 1841); August Mommsen, *Delphika* (ib., 1878); Stengel, "Griechische Kultus-Altertümer," in Müller, *Handbuch der klassischen Altertumswissenschaft*, vol. v (Munich, 1898); G. V. Schömann, *Griechische Altertümer*, vol. ii (4th ed., by J. H. Lipsius, Berlin, 1902); E. N. Gardiner, *Greek Festivals and Sports* (London, 1910).

PYTHIAN ODES. See Pindar.

PYTH'IAS. See Damon and Phintias.

PYTHIAS, Knights of. A secret, benevolent, charitable society, based upon and emphasizing fraternity and universal brotherhood. It was founded at Washington, D. C., Feb. 15, 1864, by Justus H. Rathbone and six companions who, besides a constitution, adopted a ritual previously prepared by Mr. Rathbone. The first lodge was named Washington, and the second, created April 12, 1864, was Franklin No. 2. A new constitution was adopted four years later, when the governing body of the organization, the Supreme Lodge, Knights of Pythias of the World, was created, to which grand lodges, governing bodies in the several States, were to be and have been subordinate. The fraternity confers three degrees: the initiatory rank of page, the armorial rank of esquire, and the chivalric rank of knight. Its motto is, "Be generous, brave, and true." The earlier growth of the order was slow, it numbering fewer than 7000 members in the first five years of its existence. From 1868 to 1880 lodges of the fraternity were established in rapidly growing numbers. In 1915 it had definite organization in every State in the Union and in point of numbers is the fourth largest secret society. Its castle halls are also found in the provinces of the Dominion of Canada, in the Panama Canal Zone, Hawaii, the Philippine Islands, Alaska, and Australia.

Its total membership in the United States and Canada is 729,044, the number of members elsewhere being small, the latest record placing that aggregate at 1420. In the United States more than one-third of the membership is found in Ohio, Indiana, Illinois, and Pennsylvania. The society has nine homes in as many States where its dependents, members and relatives, are cared for. More than 40 periodicals are published in its interest.

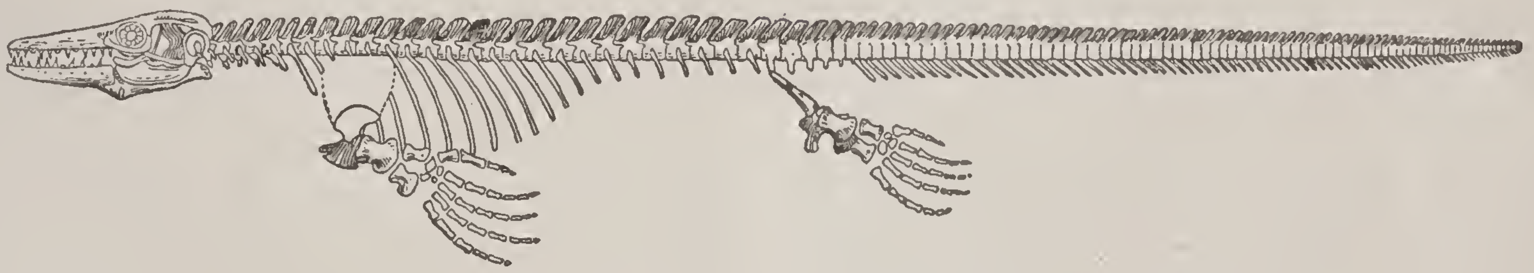
Perceiving the advantage to be obtained by utilizing the organization, so far as its members desired, to secure the benefits furnished by the mutual-assessment, secret-insurance orders, the endowment or insurance branch of the Knights of Pythias was established in 1877, under separate management but subject to the control of the Supreme Lodge. Members of the endowment branch have privileges similar to those enjoyed by all other members, in addition to which they conduct a mutual-insurance association based on assessments. Membership in this branch is 71,816, and total insurance in force is $98,686,234. The total amount paid to beneficiaries to the beginning of 1915 was $38,075,593.

The uniform rank of the order is the military division. Its chief officer is entitled major general, but control rests with the Supreme Lodge. Members are elected from those who have attained the rank of knight. In all about 20,000 Knights of Pythias are members of the military branch.

The Dramatic Order, Knights of Khorassan, is an organization that brings together the social side of the fraternity and constitutes the playground of the order. One hundred and ten temples of the Dramatic Order have been established in as many cities, and at annual conventions of the Knights of Pythias the parts which the Knights of Khorassan play are elaborate with pageantry.

The Order of Pythian Sisters, formed in 1888, is made up of women relatives of Knights of Pythias and such of the Knights as may desire to become members. It has no further connection with the Knights of Pythias except that it is recognized as an associate body. Woman membership in this sisterhood is said to exceed 75,000.

Knights of Pythias of North and South America, Europe, Asia, and Africa is an organization similar to that already described, except that it consists exclusively of negroes and that there is no affiliation or relationship between them other than similarity of names, emblems, and the like. While there are no official figures at hand, it is stated there are over 50,000 members of these colored Knights of Pythias in the United States and in some West Indian Islands.



PLATECARPUS CORYPHÆUS (RESTORED).

PY'THON (Lat., from Gk. Πύθων, from Πυθώ, *Pythō*, Πυθῶν, *Pythōn*, older name of Delphi and the surrounding region). In Greek mythology, a horrible serpent produced from the slime of Deucalion's flood. He lived on Parnassus (q.v.) and was slain by Apollo.

PYTHON. Any large snake of the subfamily Pythonidæ of the family Boidæ. The pythons differ from the boas (see Boa) in such anatomical particulars as the presence of certain supraorbital bones and two rows of subcaudal scales. The best-known species is the common adjiga or rock snake (*Python molurus*) of Ceylon, India, and eastward to China, specimens of which have been seen 30 feet long. It is yellowish, with a series of large, reddish-brown, dark-edged patches along the back, and another of smaller blotches on the sides. A snake 30 feet long could undoubtedly overcome a tiger, bear, or buffalo under favorable conditions, as has been related of these monsters. Another very large species of the Indo-China and Malayan region is *Python reticulatus*, more common eastward than the rock snake and marked in a lozenge pattern. Africa possesses several beautiful pythons, especially numerous on the equatorial west coast, where they are venerated by certain tribes and kept and tended in temples. All the pythons lend themselves easily to captivity and taming. These snakes lay a hundred or so eggs, which are regularly incubated by the female. Consult: *The Field* (London, 1894); Zoölogical Society of London, *Proceedings* (ib., 1899); R. L. Ditmars, *Reptiles of the World* (New York, 1910).

PY'THONOMOR'PHA (Neo-Lat. nom. pl., from *python*, python + Gk. μορφή, *morphē*, form). A suborder of extinct marine reptiles of serpent-like appearance, found fossil in the Upper Cretaceous rocks of Europe, North and South America, South Africa, and New Zealand. The vertebral column is made up of from 115 to 130 vertebræ; both pairs of limbs are modified into paddles for swimming; the long depressed skull is lizard-like, and the mandibles could be moved in a horizontal plane, thereby enabling them to swallow large prey. The jaws are provided with large conical teeth of formidable aspect. These animals were essentially sea serpents. The best specimens have been obtained from the chalk beds of Kansas. *Tylosaurus*, of which a finely preserved complete skeleton showing even the cartilages may be seen in the American Museum of Natural History in New York City, had a length of 30 feet. *Platecarpus* is a similar, smaller animal, with body from 10 to 15 feet long, abundant in the Cretaceous of the western United States and France. *Clidastes* was one of the smallest members of the group, with a body 6 to 12 feet long, and is from the Cretaceous of the United States. *Mosasaurus*, with its jaws armed with powerful teeth, was the largest of the group and attained a length of 40 feet. It was found in the Upper Cretaceous of western Europe and of the United

States. Consult: Williston and Case, "Kansas Mosasaurs," *Kansas University Quarterly*, vol. i (Lawrence, 1892); Williston, "On Mosasaurs, etc.," in *Kansas University Quarterly*, vol. ii (ib., 1893); id., in *University Geological Survey of Kansas*, vol. iv (Topeka, 1898); H. F. Osborn, "A Complete Mosasaur Skeleton," in *Memoirs of the American Museum of Natural History*, vol. i, part iv (New York, 1899); Von Zittel and Eastman, *Textbook of Palæontology*, vol. ii (ib., 1902).

PYX, pĭks (Lat. *pyxis*, from Gk. πυξίς, box, from πύξος, *pyxos*, box tree, boxwood). The sacred vessel used in the Roman Catholic church to contain the consecrated Host. Anciently it was sometimes of the form of a dove, which was hung suspended over the altar. More commonly, however, it was, as its name implies, a simple box, generally of the precious metals, or at least of metal plated with gold or silver, sometimes of ivory, whose use, however, was forbidden in 1588. At present the pyx is commonly cup-shaped, with a close-fitting cover of the same material. The interior is ordered to be of gold or at least plated with gold. The tabernacle from which the pyx hung over the altar received from it the name "ciborium," which is now often applied to the pyx itself. A special class of pyx is that which contains relics; these may be made of silver or ivory. The name may also be applied to the receptacle in which the Eucharist is carried to those who are sick.

PYX'IE, Pine Barren Beauty, Flowering Moss (*Pyxidanthera barbulata*). A small creeping shrub of the family Diapensiaceæ. It is a common plant in New Jersey and North Carolina upon moist sandy soil and is esteemed for its pink buds and white five-petaled blossoms, which appear in early spring.

Q

Q The seventeenth letter and thirteenth consonant of the English alphabet. In Greek this letter was called *koppa* and in Semitic *qoph.* It was early displaced in Greek by *kappa* (*k*), surviving only as a numeral sign for 90. For the development of the character, see Alphabet.

Soon after the Norman Conquest the letter was introduced into English from Norman French words in *q*. It replaced Anglo-Saxon *cw* in several Germanic words, as *queen* from *cwēn, quick* from *cwīc, quoth* from *cwæþ.*

In sound the letter is the velar explosive. Since *q* in English is always followed by *u* plus a vowel, the usual phonetic value (*kw*) is that of the velar explosive labialized. This sound is formed simultaneously in two places, the soft palate (velum) and the lips.

Qu (pronounced *kw*) represents Indo-Germanic velar *g* in its labialized form $g^{\underset{\wedge}{u}}$, Indo-Germ. **guna**, woman; Skt. *gnā*, Bœotian Gk. *βavá*, AS. *cwēn*, Eng. *queen;* Skt. *jīv*, live, Gk. *βios*; AS. *cwīc*, Eng. *quick.* On account of the difficulty of pronouncing a guttural followed by a labial semivowel there is in some languages a tendency to develop a new labial consonant *p;* thus, Gk. *πῶ*, Lat. *quō;* Lat. *quattuor;* Oscan *petora;* Welsh *pedwar;* Bret. *pevar* (but Ir. *cethir*). Contrast also Fr. *quatre* (pronounced *k*) and Rum. *patru.* Almost all the English words containing *qu* are of Latin or French origin, as *quadrangle, quart, quaint.* In some words borrowed from the French the sound is that of a simple *k*, as *pique, coquette. Qu* does not occur medially except in such compounds as *inquire, requite, inquisition.*

As a mediæval Roman numeral Q = 500. In Latin Q. was the abbreviation for Quintus.

Q. C. stands for Queen's Counsel; Q. E. D. (Lat. *quod erat demonstrandum*) = which was to be proved; *qr.* = quarter or quire; *qt.* = *quart;* q.v. (Lat. *quod vide*) = which see; q.d. (Lat. *quasi dictum*) = as if said, or (Lat. *quasi dixisset*) = as if he had said. Consult Maurice Prou, *Manuel de Paléographie* (3d ed., Paris, 1910).

QAF. See Caf.

QA'RAITES, or **KARAITES** (Heb. *ḳara'im*, readers, from *ḳara'*, to read). A Jewish sect. Anan, who died c.780 A.D., was the founder, and for some time his followers were known as Ananites. The name Kara'ites, indicating their adherence to the Scriptures (Heb. *miḳra'*) and not to the Talmud, appears for the first time in the works of Benjamin al Nahawendi (c.830 A.D.). When Anan's hereditary claims to the position of exilarch were rejected by the rabbis of Sura and Pumbeditha, he was proclaimed by those who upheld his rights. Sentenced to death by the Moslem authorities, his life was saved by Abu Hanifa (q.v.). Only fragments of his writings have been preserved by Moses ben Elijah Bashyazi (1544–72). Qaraites differ from the Rabbinites in refusing to base the calendar on astronomical calculation, in many rules concerning the Sabbath and the other festivals, in their views concerning consanguinity, and in many interpretations of the law. Their disregard for the Talmud led them to a more intense study of the Bible and also to the acceptance of many opinions of earlier dissenting bodies, like the Samaritans, the Essenes, the Sadducees, and the Zadokites. A tendency to allegorical interpretation like that of the Hellenistic Jews is seen in some of their writers, a radical criticism even of the Bible in others, as in Ishmael of Akbara and Daniel al Ḳumisi (ninth century), and strict literalism combined with asceticism in many others. The movement spread to many lands. In the sixteenth century Roman Catholic writers often compared them with the Protestants because of their opposition to tradition. Eminent among them were Nahawendi, Akbari, Ḳumisi, Ḳirḳisani, Judah Hadassi, Aaron ben Elijah of Nicomedia (fourteenth century), and Caleb Afendopolo (fifteenth century). There are about 10,000 Qaraites in Russia to-day and about 2000 elsewhere. Consult Fürst, *Geschichte des Karäerthums* (Leipzig, 1865), but especially Abraham Harkavy, article "Karaites" in the *Jewish Encyclopædia* (New York, 1904).

QUA BIRD. See Night Heron.

QUACK'ENBOS, George Payn (1826–81). An American educator, born in New York City. He graduated at Columbia in 1843 and studied law, but became a teacher in New York private schools. He edited the *Literary American* (1848–50), wrote a novel, translated Hauff's *Märchen* (1849), edited Spiers and Surenne's French dictionary (1852), and published many schoolbooks, including one on United States history (1854), one on rhetoric (1854), one on natural philosophy (1859), one on English grammar (1862), and one on practical arithmetic (1868).

QUA'COLTH. A North American Indian tribe. See Kwakiutl.

QUA'DI. An ancient Germanic people of the Suevic race, inhabiting that part of southeastern Germania (q.v.) which lay between the Gabreta Sylva, the Hercynian Forest, the Sarmatian

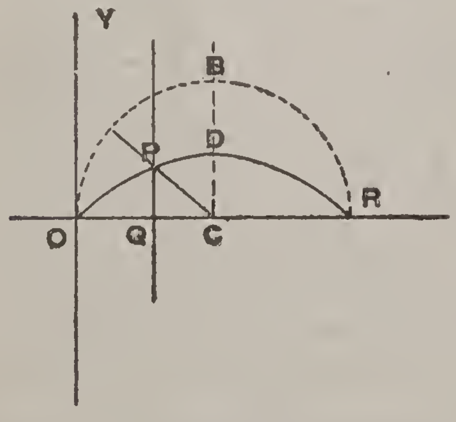
Mountains, and the Ister or Danube. The Emperor Tiberius placed them under his protection and made Vannius, one of his generals, King over them. During the reign of Marcus Aurelius the Quadi rose in alliance with the Marcomanni and other Germanic tribes. It was only after stubborn resistance that they were conquered, in 174 A.D. Six years later Commodus, the successor of Marcus Aurelius, recognized their independence. Nothing is known about them after the end of the fourth century.

QUAD′RANT (from Lat. *quadrans*, fourth part, from *quattuor*, four). In mathematics, one of the four equal parts into which a circle is divided by two perpendicular lines passing through the centre. (See Trigonometry.) In astronomy, the quadrant signifies an instrument somewhat similar to the sextant (q.v.) and formerly much used for the determination of angular measurements. The quadrant employed by Ptolemy was of stone, with one polished side, on which the graduations were made. Tycho Brahe (1546–1601) used a similar quadrant, called by him the *quadrans muralis sive tichonia*, at the observatory of Uranienborg. For an illustration of this quadrant, consult Brahe, *Astronomiæ Instauratæ Mechanica* (Wandsbek, 1598). Picard was the first who applied telescopic sights to this instrument. About this time the large mural quadrant (of 6 to 8 feet radius) began to be introduced into observatories. But these quadrants possessed various inherent defects, which led to the use of the repeating circle, otherwise called the mural circle. See Sextant.

QUADRAT′IC EQUATION. See Equation.

QUADRATIC RESIDUES. See Number.

QUAD′RATURE (Lat. *quadratura*, from *quadrare*, to square, from *quadra*, *quadrus*, square, from *quattuor*, four). In mathematics, the process of determining the area of a surface. The term comes from the conception that we find a square whose area is equal to that of a given surface. The quadrature of the circle is one of the three famous problems of antiquity, the others being the trisection of an angle (q.v.) and the duplication of the cube. (See Cube.) These problems, like that of perpetual motion, have had their devotees in all ages since the advent of geometry and physics. The quadrature of the circle means the determination of the area of a circle of given radius, or the construction by the use of only the straight edge and the compasses of a square whose area is equal to that of the given circle. It was known to the Greek geometers that the area of a circle is half the rectangle whose sides are its radius and circumference respectively, so that the determination of the length of the circumference of a circle in terms of the radius, or the evaluation of π is precisely the same problem as that of the quadrature of the circle. A brief outline of the history of attempts to evaluate the ratio π is given in the article Circle.



QUADRATRIX.

The quadrature of curves can often be effected by means of another curve, a so-called quadratrix. An important type of this curve is that probably invented by Hippias of Elis (c.400 B.C.), used both for quadrature and trisection and called the quadratrix of Dinostratus. The curve, probably the most ancient of the transcendental ones, may be defined as the plane locus of the intersection of a straight line revolving uniformly about a point and another straight line moving uniformly parallel to a given direction.

If in the figure $CO = r$ is the uniformly revolving radius, and PQ is the line moving parallel to OY, then the locus of P, their intersection, or the curve OPR, is the quadratrix. Its rectangular equation is $y = (r - x) \tan \frac{\pi x}{2r}$; r is a mean proportional between the quadrant OB and the segment CD; and thus the circumference of a circle may be expressed in terms of the radius. Whence, if it were possible to construct D geometrically, the quadrature of the circle would be effected by elementary geometry, a condition which is always understood when it is said that the quadrature of the circle cannot be effected. Another important form of the quadratrix is that of Tschirnhausen (1687). This curve may be defined as the locus of the point P, lying at the same time upon LQ parallel to BO, and upon MP, parallel to OA (OAB being a quadrant of radius $OA = r$), where L moves over the quadrant and M moves over the radius r uniformly. The equation of the curve is $y = r \sin \frac{\pi x}{2r}$. It has been used for the multisection of angles and the quadrature of curves.

Consult: Newton, *Tractatus de Quadratura Curvarum* (London, 1706); Montucla, *Histoire des recherches sur la quadrature du cercle* (Paris, 1754); Schellbach, *Ueber mechanische Quadratur* (Berlin, 2d ed., 1884); Felix Klein, *Famous Problems of Elementary Geometry* (Eng. trans., Boston, 1897); Dickson, "Construction with Ruler and Compasses," and Smith, "The History and Transcendence of π," in J. W. A. Young, *Monographs on Modern Mathematics* (New York, 1911).

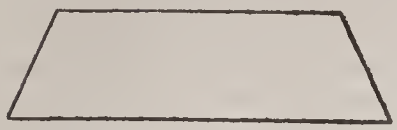
QUADRATURE. In astronomy, a planet is said to be in quadrature when there is a right angle at the earth between the direction of the planet and the direction of the sun.

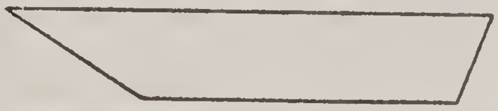
QUADREGNA, kwä-drā′nyȧ, Conte di. See Avogadro, Amadeo.

QUADRIGA, kwŏd-rī′gȧ. See Arch, Triumphal; Chariot.

QUAD′RILAT′ERAL (from Lat. *quadrilaterus*, four-sided, from *quattuor*, four + *latus*, side). A polygon (q.v.) of four sides. Among the remarkable properties of the quadrilateral are the following: the lines joining the mid-points of the successive sides form a parallelogram; the lines joining the mid-points of the opposite sides bisect each other. The bisectors of the four angles of a quadrilateral form another quadrilateral whose opposite angles are supplemental; a quadrilateral of the latter kind is inscriptible in a circle. The sum of the squares on the four sides of a quadrilateral is equal to the sum of the squares on the diagonals plus four times the square on the line joining their mid-points. A square can be constructed equal to any polygon and hence equal to any quadrilateral, but the area of a quadrilateral cannot in general be expressed as an algebraic function of the sides.

As the words are commonly used in the United States, a trapezium is a quadrilateral no two of whose sides are parallel, and a trapezoid is a plane quadrilateral having two of its sides parallel. If the angles at the extremities of either parallel side are equal, the trapezoid is said to be isosceles. If the other two sides of the trapezoid are parallel, the figure becomes a parallelogram. This is not, however, the general usage, for the trapezium has historically been more often taken to mean what is above described as a trapezoid, and vice versa. Consult T. L. Heath, *The Thirteen Books of Euclid's Elements*, vol. i (Cambridge, 1908). See Mensuration; Parallelogram.


ISOSCELES TRAPEZOID.


TRAPEZOID.

QUADRILATERAL. A common designation for the strong military line formed by the four fortresses of Mantua, Peschiera, Verona, and Legnago, which constituted a great bulwark for Austria in maintaining her dominion in northern Italy in the nineteenth century. Of great importance during the European War which began in 1914 was the Polish quadrilateral comprising the fortresses of Warsaw, Ivangorod, Novogeorgievsk, and Brest-Litovsk. See Fortification; Italy.

QUADRILLE, kwȧ-drĭl′ (Fr., square). A dance of French origin, consisting of consecutive dance movements, generally five in number, danced by couples, or sets of couples, opposite to and at right angles to one another. The name is derived from the fact that the dancers are arranged into squares consisting each of four couples. The dance originated in the French ballets of the eighteenth century and was almost immediately adopted by society. Its modern form dates from the beginning of the nineteenth century. The music alternates between triple and duple time, 3–8, or 6–8, and 2–4. Musard was the most distinguished composer of quadrille music, and under his treatment it became for a time one of the art forms.

QUADRILLE. A game of cards played by four persons. The tens, nines, and eights are discarded from the pack. The rank and order of the cards in each suit vary according as they are or are not trumps and are different in the black and red suits. The ace of spades is always the highest trump and is called Spadille; the ace of clubs, or Basto, is always the third highest trump; while the deuce of spades or clubs, or the seven of hearts or diamonds, known as Manille, is the second highest trump, according to the suit which is the trump, being always of the trump suit. When the black suits are not trumps, the black cards rank as in whist; and when they are trumps the order is the same with the exception as above mentioned of the deuce, which (in the trump suit only) becomes Manille, the deuce of the black suit which is not trumps retaining its position as the lowest card. The game is now practically obsolete. A good description of the game of Ombre or L'Hombre, practically the same game as quadrille, will be found in Pope's *Rape of the Lock*.

QUADRIV′IUM (Lat., four branches of mathematics, place where four roads meet). The name given, in the language of the schools of the West, to the higher course of the mediæval studies, from its consisting of four branches, as the lower course, for an analogous reason, was called trivium (q.v.), or three roads. The quadrivium consisted of arithmetic, music, geometry, and astronomy. These four studies compose the secondary part of the curriculum outlined by Plato in the *Republic* and are described in the seventh book of that work. See Liberal.

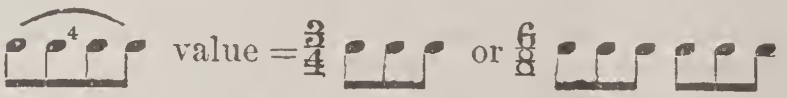
QUADROON, kwȧ-drōōn′ (from Sp. *cuarterón*, quadroon, fourth part, from *cuarto*, from Lat. *quartus*, fourth, from *quattuor*, four). The name given to a mixture of European and negro in which the relative proportion of blood is three-fourths white and one-fourth black. The first mixture is called mulatto, the second tierceroon, the third quadroon, the fourth quintroon, etc. See Miscegenation; Mixed Races.

QUADRU′MANA (Neo-Lat. nom. pl., from Lat. *quattuor*, four + *manus*, hand). In the system of Cuvier, an order of Mammalia which contained the animals most nearly resembling man in their form and anatomical characters, viz., the monkey and lemur families. The name indicates that the extremities of all limbs are *hands*, formed for grasping. The term is no longer used, as these animals are now classed with man in the order Primates (q.v.).

QUAD′RUPLE ALLIANCE (Lat. *quadruplus*, fourfold, from *quattuor*, four + *-plus*, -fold). 1. A league formed by Great Britain, France, Austria, and the Netherlands against Spain in 1718, when the policy of that country under the guidance of the ambitious Alberoni (q.v.) threatened to destroy the laboriously established balance of power in southern Europe. Consult Ottokar Weber, *Die Quadrupelalliance vom Jahre 1718* (Vienna, 1887).

2. A league formed by Great Britain, Austria, Prussia, and Russia in 1840, for the purpose of checking the power of Mehemet Ali (q.v.), whose victory over the Turks at Nisib (1839) threatened the overthrow of the reigning Ottoman dynasty. Mehemet Ali was compelled to surrender Syria, which he had overrun, and to content himself with the hereditary rule over Egypt.

QUAD′RUPLET (from Lat. *quadruplare*, to make fourfold, from *quadruplus*, fourfold). In music, a rhythmical group of four notes, the time value of which is equal to three or six of the regular rhythm. It is written thus:



QUÆSTOR, kwĕs′tôr (Lat., investigator). The title of a class of Roman magistrates reaching as far back, according to all accounts, as the period of the kings. The oldest quæstors were the *quæstores parricidii*, two in number, whose office was to conduct the prosecution of persons accused of murder and to execute the sentence that might be pronounced. They ceased to exist as early as 366 B.C. A far more important though later magistracy was the *quæstores classici*, to whom was intrusted the charge of the public treasury. They appear to have derived the epithet of *classici* from their having been originally elected by the centuries, whose members were divided into *classes*. At first they were only two in number, but in 421 B.C. two more were added. As province after province was added to the Roman Republic, the number was increased, and in the time of Cæsar it was 40. On its first institution the quæstorship was open only to patricians, but after 421 B.C. plebeians also became eligible. Consult A. H. J. Greenidge, *Roman Public Life* (London, 1901), and F. F. Abbott, *A History and Description of Roman Political Institutions* (3d ed., Boston, 1911).

QUAGGA, kwăg′ȧ (Hottentot name). One of the wild horses of South Africa (*Equus quagga*), intermediate between the horse and the zebra and now extinct. In length of ears and character of the tail it resembled the horse, although it agreed with the asses in wanting the callosity in the inner side of the hind leg. It was rather smaller than the zebras, which it resembled in its reddish-brown color and in having a dorsal stripe and its head and fore quarters irregularly banded and marked with dark-brown stripes, which became fainter until lost on the body. In some cases these transverse stripes reached back to the haunches, but they were always absent from all four legs, which were nearly white. The quagga originally wandered in great herds over the plains of South Africa, and its name was derived from its shrill, barking neigh, the last syllable of which was prolonged into a sort of scream. The flesh and hide were both of great value to the early settlers, and the animal was killed with ruthless waste by the Boers as food for their slaves and also because, by their curiosity and alertness, the quaggas interfered with hunting, alarming all other game in the neighborhood as soon as they discovered the hunter's presence. Thus by 1850 it was nearly exterminated. The quagga seemed easily susceptible to domestication and training, but few attempts seem ever to have been made in South Africa to utilize the animal. Consult: H. A. Bryden, *Nature and Sport in South Africa* (London, 1897); G. Renshaw, *Natural History Essays* (London, 1904); and early writers on zoölogy and sport in South Africa. See Extinct Animals; Zebra; and Plate of Equidæ.

QUAHOG, kwa̤′ha̤g. See Clam.

QUAI D'ORSAY, kā dôr′sǡ′. The name of a portion of the left bank of the Seine at Paris, opposite the Place de la Concorde. From the fact that the Chamber of Deputies and other government buildings front on it, its name is used to denote the French government as Downing Street denotes the English.

QUAIL (OF. *quaille*, Fr. *caille*, from ML. *quaquila*, from MDutch *quakele*, *quackel*, quail, from *quacken*, Dutch *kwaken*, to quack; onomatopoetic in origin). Originally and strictly, a small game bird of the Old World of the genus *Coturnix*, nearly allied to partridges, but having a more slender bill, a shorter tail, longer wings, no spur, and no red space above the eye. Quails never perch on trees, but always alight on the ground, and far excel partridges in their power of flight. They are among the smallest of gallinaceous birds. The common quail (*Coturnix coturnix*, or *communis*) is found in most parts of the Old World, and in the Mediterranean region, where it is most familiar, is migratory. Species of quail are found in different parts of Asia, although no other is so abundant as the common quail and none migrates as it does. The rain quail (*Coturnix coromandelica*) is numerous in India. The Chinese quail (*Excalfactoria chinensis*), only about 4 inches long, is abundant in China, and is there kept for fighting, the males being very pugnacious. It is also said to be used for another singular purpose—the warming of the hands of its owner.

In America the word "quail" is used for all those small birds that have no feathers on the tarsus. In the United States only one species occurs east of the Mississippi, the well-known bobwhite (partridge of the Southern States, quail of the North), *Colinus virginianus*, which occurs as far north as southern Maine and Minnesota. It is about 10 inches long. The upper parts are reddish brown variegated with black, buff, and gray; the forehead and band on breast black; the cheeks, throat, breast, and belly white, the latter barred with black; the sides chestnut, marked with black and white. The female has the forehead, cheeks, and throat buff. Bobwhite is in great demand for the table. It feeds on seeds, berries, and other vegetable matter. The nest is on the ground and the eggs, 10 to 18 in number, are pure white. Its loud clear notes, imitated in its name, are the three-syllabled "ah bob-white," accented sharply on the last; but the first is not always plainly heard. In the Western and Southwestern States are found several relatives (Odontophorinæ), five of which differ markedly from *Colinus*, not only in their coloration, but also in the presence of a noticeable crest. In the California quail (*Lophortyx californica*) and Gambel's quail (*Lophortyx gambeli*) the crest consists of six feathers, erect and recurved; in the mountain or painted quail (*Oreortyx pictus*) the crest is made of two long, drooping feathers; in the blue quail (*Callipepla squamata*) the crest is composed of numerous rather short, soft feathers, and the same is true of the remarkable Massena fool quail of Arizona (*Cyrtonyx montezumæ*). All these birds are exceptionally handsome, the prevailing tints being slaty blue, olive brown, chestnut or tawny, black and white. The head, especially in the male, is noticeably marked with black or brown and white. The mountain quail is the largest (1 foot long), while the Massena quail is the smallest (only 9 inches long). The eggs of *Lophortyx* and *Callipepla* are remarkable for being speckled. Consult authorities cited under Partridge; and see Plate of Partridges, etc. See Colored Plate of Game Birds, accompanying article Grouse; and of Eggs of Game and Water Birds.

QUAIN, Jones (1796–1865). An English anatomist, a brother of Richard Quain, born in Mallow, Ireland. He received his medical education in Dublin and Paris. Settling in London, he was lecturer on anatomy and physiology in the Aldersgate School of Medicine (1829–31) and professor of the same branches (1831–36). He lived in retirement during the last 20 years of his life, chiefly in Paris. He was the author of *Quain's Elements of Anatomy* (1828; 11th ed., 1915) and of a translation of Martinet's *Pathology* (1835), and also published in 1858 a series of *Anatomical Plates*.

QUAIN, Richard (1800–87). An English anatomist and surgeon, born at Fermoy, Ireland, a brother of Jones Quain. He studied medicine in London and Paris. He was appointed demonstrator in 1828 and professor of anatomy in 1832 in the University of London, resigning in 1850, and assistant surgeon in 1834 and surgeon in 1848 to the North London Hospital, from which he resigned in 1866. He was president of the Royal College of Surgeons in 1868. Among his works are: *Anatomy of the Arteries* (1844); *Diseases of the Rectum* (1854); *Clini-*

cal Lectures (1884). Dying, he bequeathed nearly £75,000 to University College, London, for education in modern languages (especially English) and in natural science.

QUAIN, Sir Richard (1816–98). An English anatomist and physician, born in Mallow, Ireland, a cousin of Richard and Jones Quain. He studied at University College, London, and became fellow in 1857 and vice president in 1889 of the Royal College of Physicians, and was elected Lumleian lecturer for 1872 and Harveian orator in 1885. In 1890 he was appointed physician extraordinary to Queen Victoria and a year later was created Baronet. In 1891 and 1896 he was elected president of the General Medical Council. Quain was especially active in the publication of the second and following editions of the *British Pharmacopœia,* acting as secretary, later as chairman of the publication committee. He published *Diseases of the Muscular Walls of the Heart* (1872), *The Healing Art in Its Historic and Prophetic Aspects* (1885), and edited the *Dictionary of Medicine* (1882; 3d ed., 1902).

QUAKER CITY. A popular name of Philadelphia, Pa., in allusion to its early settlers.

QUAKER POET. A title given to John Greenleaf Whittier. It has also been used of Bernard Barton and John Scott.

QUAKERS. See Friends.

QUAKERTOWN. A borough in Bucks Co., Pa., 16 miles south of Bethlehem, on the Quakertown and Delaware River and the Philadelphia and Reading railroads (Map: Pennsylvania, L 6). It has a public library and, among the industrial establishments, cigar and cigar-box factories, silk mills, harness factories, stove foundry, etc. Pop., 1900, 3014; 1910, 3801.

QUAKING GRASS (*Briza*). A small genus of mostly European grasses, with loose panicles and drooping, generally broad, compressed spikelets suspended by delicate stalks and tremulous in the slightest wind. The panicles are often used in winter bouquets. *Briza media* is considered a valuable pasture grass for dry situations in central Europe. It has become naturalized in the United States and Canada. *Briza maxima,* a larger species, and *Briza minor,* a smaller one, are similar in habit.

QUALITY. See Primary Qualities; Secondary Qualities.

QUAMASH, kwŏm′ăsh (from the North American Indian name), or Biscuit Root (*Camassia esculenta*). A North American bulbous plant of the family Liliaceæ, nearly allied to hyacinth, abounding on the prairies. The roasted bulbs are agreeable and nutritious and were much used by the Indians for food. The scapes, which are sheathed at their bases, are a foot or more tall and bear 10–40 blue or purple flowers. A larger-flowered plant, common in the Northwest, has often been confused with this species. It is properly designated *Camassia quamash.* Other species, indigenous to the Pacific coast region, are sometimes cultivated in the East.

QUANAH, kwä′nä. A city and the county seat of Hardeman Co., Tex., 192 miles by rail northwest of Fort Worth, on the Fort Worth and Denver City, the St. Louis and San Francisco, and the Quanah, Acme, and Pacific railroads (Map: Texas, C 2). Among the noteworthy features are the county courthouse, high school, and an irrigated farm containing a lake of 2000 acres. Cattle, cotton, corn, wheat, and cement plaster are produced in the vicinity, and there are flour mills, manufactories of cottonseed oil and cake, cotton compresses, etc. Pop., 1900, 1651; 1910, 3127.

QUANA (kwä′nȧ) **PARKER** (c.1845–1911). A Comanche chief and the most influential leader among the three confederated tribes of Kiowa, Comanche, and Apache, in southwestern Oklahoma. He was a half-breed, the son of a captive white woman who was married to a chief of the Kwahadi band. Upon the death of his father Quana Parker became chief. He was prominent in 1874, when he led 700 warriors of the confederated tribes in a desperate attack upon the fort known as the Adobe Walls on the South Canadian River in the Texas Panhandle. In the subsequent encounters he took an active part until the final surrender a year later, being the last man to come in with his band. Recognizing the advent of a new order of things, he went down into Texas to learn something of the white man's ways and returned to his tribe an apostle of civilization. In 1882 he began to advocate the leasing of the surplus pasture lands of the reservation, in which he finally succeeded, thus increasing the revenues of the tribes by more than $100,000 yearly. In 1888 he was appointed a judge of the Indian court to try minor Indian offenses. In 1892 he was the first signer of the treaty by which the lands of the reservation were opened to settlement in 1901. He made many visits to Washington as a delegate for his people and traveled extensively in other parts of the country. After the Indians were made citizens by the opening of the reservation he filled one or two local offices under the county government.

QUANTICS, kwŏn′tĭks. See Forms; Function.

QUANTITY OF MOTION. See Momentum.

QUANTUM (kwŏn′tŭm) **HYPOTHESIS.** See Radiation.

QUANTZ, kvänts, Johann Joachim (1697–1773). A German flautist, born at Oberscheden, Hanover. In 1716 he went to Dresden, where he joined the town orchestra under Heine. He was at first an oboist, but, after a thorough course of instruction under Buffadin, he exchanged the oboe for the flute. In 1728 he played before Frederick the Great (then Crown Prince) at Berlin and so delighted him that he arranged for personal instruction on the flute. When Frederick ascended the throne, in 1740, the flautist was called to Berlin as chamber musician and court composer, which position he held till his death. His published compositions include 6 flute sonatas with bass (1734), 6 duets for flutes (1759), choral melodies to 22 odes by Gellert (1760), and *Application pour la flûte traversière à deux clefs.* About 300 flute concertos and 200 different compositions for flute (duos, trios, quartets, and soli) are preserved in manuscript in Potsdam. Quantz improved the flute by the addition of a second key and the sliding top for tuning the instrument.

QUAPAW, kwä′pạ (from *Ugaqpa,* down stream). A tribe of Siouan stock (q.v.), prominent formerly, under the name of Arkansas, as the allies of the French in the early days of the Louisiana Colony. The Quapaw, Omaha, Ponca, Osage, and Kaw speak dialects of the same language and according to their traditions, borne out by historical evidence, formerly lived as one people in the eastern part of the United States, but migrated westward and separated near the mouth of the Ohio, where the Quapaw turned southward, while the others continued west or north. Under the name of Capaha they are mentioned in the De Soto narrative of 1540; they were then located on the Mississippi apparently not far above Memphis. In 1818 they sold all of their claims in Arkansas, upper Louisiana, and on the east bank of the Mississippi, excepting a reservation extending from the Arkansas southward to the Saline River. They were then rapidly declining from whisky and wars with other tribes, but were still estimated at 1000. They drifted westward until the remnant, a few hundred including mixed bloods, was finally gathered upon their small reservation in the northeastern corner of Oklahoma. In their former aboriginal characteristics and customs they resembled the Osage, but seem to have been of more warlike spirit and fixity of purpose. The few that remain (231 in 1915) appear to be prosperous and able to hold their own with their white neighbors.

QUARANTINE, kwŏr′*a*n-tēn (It. *quarantina*, from ML. *quarantena*, period of forty days' quarantine, number forty, Lent, from Lat. *quadraginta*, forty). Originally the period of 40 days during which a ship arriving in port and suspected of being infected with a contagious, malignant disease was forbidden to land freight or passengers. From the second half of the fourteenth century the Italian republics established quarantine regulations, directed towards the East, against the invasion of pestilence. In 1403 Venice instituted the first maritime quarantine, followed by Genoa in 1467. During the latter part of the eighteenth century Austria stretched a permanent cordon of troops across her eastern frontier, but even this failed to shut out the plague, which ravaged her provinces. The example of the Italian cities was early adopted by Marseilles, and an efficient system of sanitary supervision was developed, finally passing under the control of the sanitary magistrates. Other European seaport cities enforced rules and regulations of varying effectiveness. In 1850 delegates from the principal states bordering the Mediterranean convened in Paris and adopted a convention and code of international sanitary regulations, which was subsequently generally adopted by all powers and is enforced in their commercial relations with one another. Under its provisions a ship clearing is given a clean bill or a foul bill according as the port from which she sails is free or infected with a contagious disease, the plague, cholera, and yellow fever being especially guarded against. Ships entering port are at once put under quarantine, varying in length with the character of the contagion feared. Further regulations are laid down regarding the disinfecting and handling of merchandise in cargo. Special restrictions have also been adopted against the Oriental countries, Egypt and Turkey, and for this purpose sanitary boards are maintained in Alexandria, Constantinople, and other frequented ports, with physicians located in different parts of the countries liable to epidemic diseases, whose duty it is to investigate and report to the local authorities and consular offices the condition of the general health.

In modern usage the term "quarantine" is also applied to the sanitary rules and regulations adopted within a state to restrict the spread of contagious diseases within its own boundaries. They are enacted by the state in the exercise of its sovereign power (see POLICE POWER), and so absolute is this that even summary proceedings invading the rights of the individual or destroying valuable property are upheld as constitutional. Besides the Federal quarantine regulations providing for the protection of the United States in its intercourse with foreign nations, the various State jurisdictions have general statutes authorizing the organization of State boards of health and similar local boards in cities, villages, and towns, prescribing how they shall be constituted and defining their powers and duties. This power is usually conferred upon municipal corporations by the charter granted by the legislature or by general statute, but, in the absence of such express authority, it cannot be implied as incident to the ordinary powers of the corporation. Conflict between the United States and State authorities is provided for by the terms of the Federal statutes (U. S. Rev. Stats., § 4792; Rev. Stats., U. S. Supp., 1874–91, p. 157, c. 66, § 5) requiring customs, revenue, and other Federal officers to observe State health and quarantine laws. Reasonable charges for quarantine services may be imposed upon a vessel under State authority, and there can be no recovery from the State or municipality for losses resulting from the quarantining or disinfecting of premises infected with contagious disease, where the method employed was proper and the use made of the premises was a necessary one. Further, a municipality cannot be held liable for an act of its health officer in wrongfully confining in quarantine a citizen reasonably believed to be afflicted with a contagious disease, since the act done is governmental in its character; but the officer may become personally liable where he acted wrongfully or in excess of his duty. A carrier is protected from liability for nondelivery of goods or passengers where such act would be a violation of quarantine regulations.

The *widow's quarantine* was the term applied under the common law to her right to remain in the mansion house 40 days after her husband's death, during which time her dower should be admeasured and assigned. This right was guaranteed by section 7 of the Magna Charta and has been perpetuated with various modifications in the statutes of the several States.

Consult: Sir S. Baker, *Laws Relating to Quarantine* (London, 1879); Parker and Worthington, *Public Health and Safety* (1892); A. H. Doty, *Prevention of Infectious Diseases* (New York, 1911); *Quarantine in the Maritime Cities of the United States*, published by the New York Academy of Medicine (ib., 1913); also publications of the United States Bureau of Public Health and Marine Hospital Service (Washington).

QUAREGNON, kȧ′re-nyôɴ′. A mining town of Belgium, in the Province of Hainault, situated 4 miles west of Mons. There are large and important coal mines and blast furnaces. Pop., 1900, 16,249; 1910, 18,675.

QUARITCH, kwŏr′ĭch, BERNARD (1819–99). An English bookseller, born at Worbis in Prussian Saxony. He was a bookseller's clerk in Germany till 1842, then went to London, where he was first employed by the publisher Bohn and where eventually he set up for himself, becoming a British subject in 1847. Throughout his life he had made a specialty of Oriental literature, and he printed grammars in the Turkish, Persian, and Arabic languages, besides making a collection of Oriental manuscripts. Probably the best-known books from his press were the first four editions of FitzGerald's (q.v.) *Omar Khayyám.* He was represented at all the great book sales in Europe and America and acquired many rare works. His invaluable catalogues include: the first (1860); a great catalogue of 2395 pages (1880); the *Biblioteca Xylographica, Typographica, et Palæographica* (1873), a catalogue of early productions of the printing press in all countries; and his last, *General Catalogue of Old Books and Manuscripts* (7 vols., 1887–88; with supplements, 12 vols.). He was succeeded by his son.

QUARLES, kwärlz, FRANCIS (1592–1644). An English poet, born at Rumford, Essex, educated at Cambridge, and subsequently entered at Lincoln's Inn. He held several minor posts of honor or emolument under Royalist favor. Of his 18 children one, John Quarles (1624–65), is remembered as the author of *Fons Lachrymarum* (1648) and of other poems. As an author Quarles the elder was variously active—as a pious poet, as a writer of books of devotion, and as a prose romancer. Originally Quarles's productions were received with solemn popular satisfaction, but the critics of the seventeenth and eighteenth centuries, Suckling, Pope, and others, sneered at him. His collected works, edited by A. B. Grosart, appeared (1874) in the Chertsey Worthies Library. Consult F. E. Hutchinson, "The Sacred Poets," in *Cambridge History of English Literature,* vol. vii (New York, 1911).

QUARLES, JOHN. See QUARLES, FRANCIS.

QUARRY, kwŏr'ĭ (OF. *quarré,* square). In ornament and decoration this word is used to designate (1) a decorative pattern formed by two sets of intersecting lines forming equal four-sided meshes and (2) a unit or mesh of such a pattern. When the meshes are filled each with a floral or other ornament, the design or pattern is called a diaper (q.v.); but many writers use "quarry" to designate both the open-mesh and the decorated patterns. In England diamond-shaped tiles and panes of glass, or squares of either set diagonally, are sometimes called quarries or quarrels.

QUARRY, QUARRYING (OF. *quarriere,* Fr. *carrière,* from ML. *quadraria,* quarry, place where stones are squared, from Lat. *quadratus,* p.p. of *quadrare,* to square). The open excavation from which any useful stone is taken for building and engineering purposes is called a quarry; the operations required to obtain rock in useful form from a quarry are called quarrying. Quarrying processes are three in number, viz., by hand tools, by explosives, and by channeling and wedging. To understand the operations of the quarryman it is necessary to bear in mind that all rocks belong to one or other of two great classes, viz., the stratified and the unstratified. The former are sedimentary rocks occurring in parallel beds or strata, and consist chiefly, in so far as we are at present concerned, of sandstone and limestone. Unstratified or igneous rocks, which include greenstone or whinstone, granite, and porphyry, have no distinct bedding, i.e., they do not lie in separate layers. Roofing slate is a metamorphic rock, and splits into thinner laminæ in the direction of its *cleavage* than in the direction of its bedding, the former being often at right angles to the latter. Granite and other igneous rocks have also a natural jointing, although they are not stratified. Advantage is taken of these peculiarities in quarrying the different rocks, but in the main the systems adopted do not greatly differ.

Hand tools alone may be successfully used for quarrying stone which exists in beds. The principal hand tools are the pick, the crowbar, the drill, hammer, wedge and plug, and feathers. With the drill and hand hammer a row of holes a few inches apart is drilled partly through the layer or stratum, perpendicular to its plane of stratification and along the line at which it is desired to break the stone. These holes are usually drilled from ⅜ inches to ¾ inches in diameter. In each hole are placed a plug and two feathers. The plug is a narrow wedge with plane faces; the feathers are wedges flat on one side and rounded on the other. When a plug is placed between two feathers the three together will slip into a cylindrical hole, and by driving the plug down between the feathers it exerts a splitting or cleaving force of great intensity. In quarrying, as first stated, each hole in a long row is filled with a plug and feathers; by striking each plug a sharp blow with a hammer, hitting them in succession, and by repeating the operation again and again, the combined splitting force of the plugs and feathers finally becomes great enough to rupture the rock. Generally the plugs and feathers are used only for effecting the larger subdivisions of the rock, the smaller pieces being split and broken by hammers and wedges. Sometimes this method of quarrying is called the plug-and-feather method.

Explosives are the means most commonly employed for detaching large blocks of stone in quarries, these blocks being afterward split and broken into smaller stones by wedges or by the plug-and-feather method. In this method of quarrying the drill holes are put down to the depth to which it is required to break the rock and are then partly filled with some explosive, which is discharged by the usual methods of blasting (q.v.). The kind of explosive used depends upon the character of the result which is sought. In quarrying rock to be crushed into small fragments for road work, concrete making, etc., the object sought is a rather finely broken mass of stone, and here, because of its great shattering effect, some form of high explosive, as dynamite, is employed. When building stone of large size is to be quarried, weaker and slower-acting explosives, as gunpowder, are employed. The drill holes are usually made by rock drills operated by power, though hand drills and churn drills are also used. The drill holes are driven vertically in a row some distance back of and parallel to the edge of the working face of the quarry and are blasted simultaneously so as to force outward a rectangular mass of rock.

Channeling is the process of cutting long narrow channels in rock to free the sides of large blocks of stone. Channeling machines, or channelers, are made in a variety of forms, the most common of which is a vertical steam boiler mounted on wheels and provided with mechanism for self-propulsion, having on the same carriage with the boiler a steam cylinder which operates, like a percussion drill, a flat bar with a cutting edge. In operation the machine is run forward and back so as to carry the cutter back and forth along the line on which the channel cut is to be made. If the rock is in layers the channel cut is often not made the full depth of the layer, but is sunk deep enough to permit the insertion of wedges by which the rock is split, the cut or groove guiding the fracture. When the rock is not in layers it is often necessary to undercut the block as well as to cut a channel around it. This is done by drilling a series of holes along the bottom, the process being called gadding by quarrymen. Wedges inserted in the drill holes serve to separate or split the rock at the bottom. A special form of machine called a gadder is used for undercutting. It consists essentially of a rock drill arranged to be operated horizontally and receiving motion from an engine taking steam from a vertical boiler, the whole being mounted on a carriage. The channeling and wedging process of quarrying is extensively used in quarrying marble, sandstone, limestone, and the other softer rocks, but is not a successful process for granite and other similarly hard stones. For a description of the methods and tools used in cutting quarry stone into suitable shapes for structural purpose, see STONE CUTTING AND DRESSING.

Bibliography. G. P. Merrill, *Stones for Building and Decoration* (3d ed., New York, 1903); C. L. Foster, *Elements of Mining and Quarrying* (ib., 1903); H. P. Gillette, *Rock Excavation: Methods and Cost* (ib., 1904); W. G. Renwick, *Marbles and Marble Working* (London, 1909); C. L. Foster, *Treatise on Ore and Stone Mining* (7th ed., ib., 1910); D. H. Newland, *Mining and Quarry Industry in New York State* (Albany, 1913). See illustration with the article MARBLE; also the articles BUILDING STONE; DRILL; EXPLOSIVES.

QUAR′TAN FEVER. See MALARIA AND MALARIAL FEVER.

QUARTER. See WEIGHTS AND MEASURES.

QUARTER CRACK. A form of sand crack, an affection of the horse; specifically a vertical crack in the horn of the lateral part of the wall of the foot. When the crack is directly in front it is called a toe crack. Toe cracks are most common in the hind feet, while quartercracks nearly always affect the fore feet, and similarly the inside quarter is more liable to the injury than the outside one, in that when in motion it is subject to a greater part of the weight of the horse. In the normal foot the coronet or (for authorities differ) the sensitive laminæ which cover the external surface of the pedal bone secretes an adhesive material which binds firmly together the fibres of the wall of the hoof. When the secreting membrane is prevented from carrying out its functions the material secreted under such conditions loses its power and the horn which it supplies becomes deficient in strength. Where this disease is of hereditary tendency the horn is so weak that it would seem to split if subjected to a violent strain. Relative dryness of the horn is the principal predisposing cause of sand cracks, while a predisposition to quarter cracks exists in contracted feet and in those where the toe turns out or the inside quarter turns under. The various forms of sand crack may be caused by the much to be condemned system of using seated shoes and of paring the frog, an unnatural custom by which the entire weight of the animal is thrown on the crust of the foot instead of being properly distributed between the wall, the frog, the outer portion of the sole, and the bars. Among other causes of perverted secretion may be mentioned hard ground and the strain of fast work. Cart and cab horses are especially liable to sand crack. The usual treatment is: (1) To prevent movement between the edges of the crack; (2) to heal the exposed tissues should they be wounded or inflamed; and (3) to encourage the downward growth of sound horn from above a crack, for it is evident that as the edges of the crack cannot reunite, the growing down of the crack is the only effective remedy. Consult M. H. Hayes, *Veterinary Notes for Horse Owners* (London, 1897), and Leonard Pearson and others, *Special Report on Diseases of the Horse*, published by United States Bureau of Animal Industry (rev. ed., Washington, 1911).

QUARTER DAYS. Conventional dates on which, by custom or agreement, leases begin and terminate and rent becomes payable in England. Rents are generally made payable by the express terms of the lease on the usual quarter days. These are, in England and Ireland, Lady Day, March 25; Midsummer Day, June 24; Michaelmas Day, September 29; and Christmas Day, December 25. In Scotland there are two legal terms in each year and two conventional terms, the latter being adopted only when expressly so agreed. The legal terms are Whitsunday, May 15, and Martinmas, November 11; and the conventional terms are Candlemas, February 2, and Lammas, August 1. The law of Scotland differs from that of England in this, that if nothing is said between the parties on letting houses and lands, these legal terms are impliedly included as part of the agreement, both as regards time of entry and payment of rent.

QUAR′TERING. In heraldry, the bearing of two or more coats on a shield divided by horizontal and perpendicular lines. See HERALDRY, *Marshaling of Arms.*

QUARTERING. See BILLETING.

QUARTERING. See HANGING.

QUAR′TERMAS′TER. In the United States Army, a commissioned officer serving either on the staff supply department or bureau known as the quartermaster corps or in a line regiment or battalion as regimental or battalion quartermaster. These regimental officers are assisted by quartermaster sergeants in the performance of duties connected with the service of supply. To each troop, battery, and company is allowed one quartermaster sergeant to assist the captain in similar duties. The quartermaster corps, whose chief, the quartermaster-general, has the rank of major general, with headquarters at the War Department, Washington, D. C., is the supply department of the army. Formerly there were a subsistence department, supplying rations, and a pay department charged with the distribution and accounting for funds for payment of the army. Both of these have been absorbed by the quartermaster corps (Act of Aug. 24, 1912), which performs all the duties formerly divided between three independent departments. The quartermaster corps is charged with the duty of providing means of transportation of every character, either under contract or in kind, which may be needed in the movement of troops and the material of war. It furnishes all public animals employed in the service of the army, the forage consumed by them, wagons and all articles for their use, and the horse equipment for the quartermaster corps. It furnishes clothing, camp and garrison equipage, barracks, storehouses, and other buildings; constructs and repairs roads, railways, bridges; builds and charters ships, boats, docks, and wharves needed for military purposes; supplies subsistence for enlisted men and others entitled thereto; supplies articles for authorized sales and issues; furnishes lists of articles authorized to be kept for sale; gives instructions for procuring, distributing, issuing, selling, and accounting for all quartermaster and subsistence supplies; has charge of the supply and distribution of and accounting for funds for the payment of the army and such other financial duties as are specially assigned to it; and attends to all matters connected with military operations which are not expressly assigned to some other bureau of the War Department.

Besides commissioned officers there are enlisted members of the quartermaster corps, consisting of such number and grades as the Secretary of War may from time to time authorize under the provision of law. In 1915 the authorized personnel of the corps was as follows: 1 major general (the quartermaster-general); 2 brigadier generals; 14 colonels; 20 lieutenant colonels; 48 majors; 102 captains; 15 master electricians; 403 quartermaster sergeants, quartermaster corps; 600 sergeants, first class; 1000 sergeants; 650 corporals; 45 cooks; 2500 privates, first class; 1190 privates; total commissioned, 187; total enlisted, 6403; aggregate, 6590. Under the Act of Aug. 24, 1912, the 6000 authorized enlisted men of the quartermaster corps are not to be counted as part of the strength of the army. The officers of the quartermaster corps are detailed from the line of the army for periods of four years, after which they return to duty with their line regiments. A number of the higher grades are still filled by officers holding permanent appointments as quartermasters under the old law. As vacancies therein occur they will be finally filled by detailed officers, so that the entire corps will ultimately be a detailed corps in which the position is held for four years only, under the provisions of the Act of Feb. 2, 1901.

In the British army regimental quartermasters are usually noncommissioned or warrant officers of long service, who receive the commission of honorary lieutenant with their appointment of quartermaster. They combine subsistence with their regular quartermaster's duties, being responsible for the quantity of all food supplies required by the regiment or corps with which they serve. There are no company or troop quartermaster sergeants, color sergeants (q.v.) of companies being responsible for that branch of work. There is also a quartermaster-general with a staff. See ARMY ORGANIZATION.

In the navy and merchant service a quartermaster is a petty officer who assists in the navigation of the ship. At sea he superintends the steering of the seaman at the wheel, looks out for the log, writes up the columns in the log book, and has charge of the navigator's stores. He also keeps a lookout with his spyglass both in port and at sea, reporting such occurrences as are of interest to the commanding officer or officer of the deck.

QUARTERMASTER CORPS. See QUARTERMASTER.

QUARTERS, MILITARY. See PAY AND ALLOWANCES.

QUARTER SESSIONS. In England, a court or meeting of justices of the peace, who assemble every quarter of the year for judicial as well as miscellaneous business. It is an inferior court of record, having power to punish for contempt of court, to adjourn cases, and to summon juries for adjourned sittings. The meetings are fixed by statute to be held in the first full week after December 28, March 31, June 24, and October 11 respectively. The chief officer of the Court of Quarter Sessions is the clerk of the peace. The original jurisdiction of the Court of Quarter Sessions is largely confined to criminal business, but it has certain minor civil jurisdiction by virtue of statutes and also appeals from certain courts of summary jurisdiction. Most of the administrative business formerly attended to by the Court of Quarter Sessions was transferred to the county councils in 1888. In Scotland there is also a Court of Quarter Sessions of the Peace, held four times a year at the county town. Consult: J. F. Archbold, *Practice of the Quarter Sessions* (5th ed., London, 1898); T. S. Pritchard, *Jurisdiction, Practice, and Procedure of the Quarter Sessions* (2d ed., ib., 1904).

QUARTET′ (It. *quaretto*, from *quarto*, Lat. *quartus*, fourth, from *quattuor*, four). A concerted composition for four voices or instruments, in which all the parts are real, i.e., no one can be omitted without injuring the proper effect of the whole. As early as the fifteenth century four-part writing had been recognized as the kind most suitable for combining harmonic fullness and clearness with ease of execution. Since then it has been regarded as the groundwork of all composition. During the seventeenth century, however, the tendency was towards the employment of large masses in double and triple choruses (schools of Rome and Venice; see MUSIC, HISTORY OF). But during the eighteenth century the development of the string quartet led to a return to four-part writing. In the nineteenth century Mendelssohn and Schumann did much to popularize the male quartet. One of the highest forms of modern music is that written for the string quartet, which consists of two violins, viola, and cello. Although this combination of instruments was established by Monteverde (q.v.) as the foundation of his orchestra, no music was written for it until a century and a half later, when Haydn recognized the possibilities of this group of instruments. Haydn is the father of the modern quartet. He took the sonata form and in 1755 wrote a miniature symphony for the string quartet. Although this first quartet is very crude, Haydn soon acquired mastery of the form. He wrote in all 83 quartets. Mozart, who greatly developed the quartet, did not, like Haydn, regard it as a miniature symphony to express only miniature ideas. Some of the boldest effects in Mozart's works are found in his quartets. During the lifetime of Haydn and Mozart the quartet was assiduously cultivated by lesser composers, such as Gossec, Grétry, Sammartini, Romberg, Ries, Onslow, and others. They were succeeded by the unrivaled master of the string quartet, Beethoven. The first violin no longer had the principal melody; he placed all four instruments on a footing of absolute independence. He wrote only 16 quartets, but in these monumental works all the possibilities of the form are exhausted. Schubert wrote 20 quartets which are scarcely inferior to those of his predecessor either in profound ideas or mastery of technical workmanship. While Beethoven occasionally allows one or two instruments to rest (producing a certain thinness of tone), Schubert keeps every instrument at work from beginning to end. Schumann wrote only three quartets (op. 41), but they can be ranked with those of Beethoven and Schubert. Spohr wrote 33 quartets and four double quartets. His quartets are more like those of Haydn and Mozart; the independence of the several instruments is sacrificed to the predominance of melody in the first violin. The same is true of Mendelssohn's quartets. The second violin and viola too frequently have only filling-up work, like tremolo, etc. Another master is Brahms, whose quartets are written entirely on the lines of his great predecessors. Some of the most important instrumental quartet organizations, with their original members, are the *Müller*, the brothers Karl, Theodor, August, Franz Müller; the *Florentine*, Becker, Masi, Chiostri, Hilpert; the *Hellmesberger*, Georg, Joseph, Joseph, Jr., and Ferdinand Hellmesberger; the *Schuppanzigh*, Schuppanzigh, Sina, Weiss, Kraft; the *Joachim*, Joachim, De Ahna, Wirth, Hausmann; the *Kneisel*, Kneisel, Roth, Svecenski, Schroeder; the *Bohemian*, Hoffman, Suk, Nedbal, Wihom; the *Brodsky*, Brodsky, Becker, Sitt, Klengel; the *Flonzaley*, Betti, Pochon, Ara, Archambault; *Quatuor de Paris*, Hayot, André, Dénayer, Salmon; *Quatuor Capet*, Capet, Bailly, Tourret, Hasselmans.

QUARTIER LATIN, kȧr′tyȧ′ lȧ′tăɴ′ (Fr., Latin quarter). The famous student section of Paris, a district south of the Seine, containing the Sorbonne, the Collège de France, the Institute, the Luxembourg, Panthéon, and various schools. The name *quartier* or *pays latin* was given to it because Latin was the language of mediæval scholasticism. The Latin quarter has always been the centre of youthful revolutionary ideas and a synonym for Bohemian life.

QUARTILE, kwôr′tĭl. See ASPECTS.

QUAR′TODEC′IMAN. A name applied to the party in the early Christian Church which believed in celebrating Easter on the fourteenth day after the full moon, by analogy with the Jewish usage regarding the Passover. See EASTER; NICÆA, COUNCILS OF.

QUARTZ, kwôrts (MHG. *quarz*, Ger. *Quarz*, rock crystal, quartz). A mineral composed of silica or silicon dioxide, crystallizing in the hexagonal system. It is very hard, scratching glass readily, and has a specific gravity of from 2.5 to 2.8, according to the amount of impurity. When pure it is colorless and perfectly transparent, but it often has some shade of yellow, red, brown, green, blue, or black. By friction it becomes positively electrified. It is a very abundant and widely distributed mineral, largely composing the sands found on beaches and being also a constituent of most rocks. (See ROCK.) The mineral species includes two important groups—those that are crystallized and have a vitreous lustre, called phenocrystalline, and those that are massive and flintlike, called cryptocrystalline.

The phenocrystalline varieties of quartz include amethyst, asteriated or star quartz, aventurine, cairngorm, morion or smoky quartz, cat's-eye, citrine or false, Saxon, Scottish or Spanish topaz, ferruginous quartz, or rubasse (sometimes called ancona or Mont Blanc ruby), hyaline, milky or greasy quartz, rock crystal (including the Brazilian pebble, Lake George diamonds, etc.), rose quartz, sagenitic quartz, and sapphirine, or siderite. The cryptocrystalline varieties include agate (banded or eye agates, fortification or ruin agates, dendritic agate, moss agate, agatized wood, etc.), basanite (lydian stone or touchstone), beekite, bloodstone or heliotrope, carnelian, chalcedony, chrysoprase, flint, hornstone, jasper, onyx, plasma, prase, sard, and sardonyx. In addition to the foregoing should be mentioned quartz rock or quartzite (q.v.). Of similar nature are the different varieties of pseudomorphous quartz, such as the agatized wood and beekite previously mentioned.

The common variety of crystallized quartz is employed in the arts as an abrasive, principally in the manufacture of sandpaper. It is also crushed and used for polishing marble and as a filler for wood. Quartz sands are of importance in the manufacture of glass, refractory brick, mortar, cements, etc. The occurrence of quartz in the form of veins is noteworthy from the fact that such veins are the sources of many of the valuable metals, including gold, silver, copper, and lead. See ORE DEPOSITS.

QUARTZ′ITE (named from the mineral quartz, which is its principal constituent). A metamorphic rock, composed essentially of quartz and produced from the alteration of sandstone (q.v.). The process of alteration consists of the enlargement of the sand grains which compose the sandstone through accretion of silica in aqueous solution. This accretion of silica cements neighboring grains together by crystallizing around them and forms as a result a dense vitreous rock which usually discloses little if any evidence of its original nature. Quartzites frequently contain small amounts of other minerals, especially feldspar and mica, and thus grade into some of the other varieties of metamorphic rocks (q.v.).

QUARTZ MINING. See GOLD.

QUARTZ VEIN. A term applied to a fissure filled with quartz. Such veins are usually formed by precipitation from solution, but may be of igneous origin. At times the quartz carries gold or other metals and is valuable as an ore. See ORE DEPOSITS.

QUA′SI (Lat., as - if, as it were) **CONTRACT.** This is a generic term in law, of modern origin, invented to denote all those obligations to pay money which do not arise from either true contract or tort. (See CONTRACT.) The distinction between true contracts and quasi contracts lies in the source of the two classes of obligations. All true contracts are founded upon intention, there being no true contract which does not result from the meeting of the minds of the parties to it. Quasi contracts, on the other hand, are obligations which are imposed by law without any reference to the intent or consent of the party whose legal duty it is to perform the obligation.

The term "implied contract" as used in earlier classifications of contracts was applicable either to a real contract, i.e., one flowing from intent, inferred from the acts of the parties, or to a so-called contract implied in law, which was not a true contract, but a quasi contract.

Quasi-contract obligations resemble torts in that both are obligations imposed by law; but while in general the duty imposed by the law of tort is to forbear, a quasi-contract obligation imposes the duty of action, viz., the payment of a definite sum of money. A tort also is in general the violation of a right in rem, for which the wrongdoer must respond in damages; but the defendant who is liable in quasi contract has either not acted at all, as in case of one who is required to pay a tax or penalty, or if he has acted has done so with the consent and coöperation of the plaintiff, as one who has received money paid by mistake. There is a still further distinction between tort and quasi contract, which has some value, although not of universal application. While the liability of the tortfeasor is to pay damages for the injury which the plaintiff has suffered from his tortious act, the liability in quasi contracts is generally the restoration to the plaintiff of money or the money value of property which the defendant has secured at the plaintiff's expense and which upon legal or equitable grounds should be returned to him. Thus, the remedy for negligent injury of the plaintiff's property is a tort action. The remedy for appropriation of the plaintiff's property by the defendant may be an action in quasi contract to recover the value of the property, or, as will appear, the plaintiff may seek his remedy in tort to recover damages for its conversion, the same act giving rise to an action either in quasi contract or tort at the election of the plaintiff.

The following is a classification of quasi-contractual obligations which has been followed to some extent and which, although not free from criticism, is perhaps as satisfactory as any which has been suggested:

Quasi contracts may be said to be founded (1) upon a record, (2) upon statutory or official or common-law duty, (3) upon the doctrine that no one shall be enriched at the expense of another.

(1) It is clear that record obligations or judgments are not true contracts, since they are imposed without the consent of the judgment debtor and properly form one distinct class of quasi contracts.

(2) The second class includes all obligations to pay money imposed by some positive rule of law, whether by statute or common law. It includes the obligation to pay penalties imposed by statute, the obligation of a sheriff to pay the proceeds of a levy to the judgment creditor, the obligation of an infant or lunatic to pay for necessaries, the obligation of a husband to pay for necessaries supplied to his wife—being examples of true quasi contract.

(3) The third class embraces all other recognized quasi contracts, and in all there is present the element of unjust enrichment of the defendant at the plaintiff's expense. It cannot be said, however, that unjust enrichment is a definite rule or principle of decision such that a plaintiff is entitled to recover in every case of unjust enrichment at his expense. The scope of this subdivision of quasi contracts will be best understood by referring briefly to the more important groups of cases included within it.

Money Paid by Mistake. It is a general rule that money paid or the value of property delivered to another under mistake of fact may be recovered in a quasi-contract action. If, however, the mistake is one of law, no recovery is allowed.

Waiver of Tort. As has already been said, there are certain circumstances under which one who has suffered injury by the tortious act of another may at his election sue either in tort or quasi contract. As the remedies are not concurrent, the election of the plaintiff to sue in *indebitatus assumpsit* or quasi contract is said to be a waiver of the tort. The basis of recovery is restitution, the return to the plaintiff of the money value of property taken from the plaintiff by the defendant's tortious act. Torts therefore give rise to quasi contracts only when the tortfeasor has by his wrongdoing enriched himself at the expense of the plaintiff. Thus, if the defendant's tort consists merely in injuring or destroying the plaintiff's property without direct benefit to the defendant, the sole remedy is in tort.

Plaintiff in Default under a Contract. In general a plaintiff who is in default under a contract has no right either upon the contract or in quasi contract. If, however, performance by the plaintiff has become impossible and the contract is one which may be said to contemplate impossibility of performance so that the impossibility is an excuse for the plaintiff's nonperformance, he may recover in quasi contract the value of the performance which he has already given under the contract. Thus, in contracts for personal service, if one is unable to perform because of sickness or death, he or his estate is entitled to recover the reasonable value of services rendered up to the time of the impossibility of performance. When the plaintiff is in default under a contract which the courts will not enforce because it is illegal, he may recover the actual value of his performance already rendered if the contract is *malum prohibitum* (see MALUM IN SE AND MALUM PROHIBITUM) only, but in case of contract *malum in se* the law leaves the parties to it without relief.

Defendant in Default under a Contract. When a defendant is in default under a contract because performance by him has become impossible, the plaintiff is entitled to recover in quasi contract for benefits conferred by him upon the defendant, and this is permitted irrespective of the liability of the defendant to respond in damages for his breach of the contract. Thus, freight money paid in advance may be recovered from the carrier if performance by him becomes impossible; or if one has paid in advance for the personal services of another who is unable to complete his performance because of sickness or death, he may recover in quasi contract the proportion of the compensation remaining unearned. The same rule of recovery is applied whenever the defendant is willfully or inexcusably in default under his contract under such circumstances that he may be said to have abandoned the contract. In case the defendant is in default under a contract which is illegal, the plaintiff's right of recovery in quasi contract depends upon the character of the contract. If the contract is *malum in se*, there can be no recovery. If it is *malum prohibitum*, there can still be no recovery if the plaintiff is in equal wrong (*in pari delicto*) with the defendant. If, however, the plaintiff is not *in pari delicto*, he may recover the value of the performance which he has given to the defendant under his contract.

In general, whenever a defendant is in default under a contract which cannot be enforced because it does not comply with the statute of frauds, the plaintiff may recover the money value of the performance which he has given to the defendant under his contract. The measure of recovery, as in all other cases of quasi contract, is the value of the benefit conferred on the defendant by the plaintiff and not necessarily the contract price.

In all cases the basis of recovery is the duty of the defendant to restore to the plaintiff money or money value of property which he has received at the plaintiff's expense and which upon legal or equitable grounds he should return to the plaintiff. Consult: W. A. Keener, *The Law of Quasi Contracts* (New York, 1893); E. H. Woodruff, *Selected Cases on the Law of Quasi Contracts* (Indianapolis, 1905); W. S. Pattee, *Cases on Quasi Contracts* (Minneapolis, 1911); F. C. Woodward, *Law of Quasi Contracts* (Boston, 1913).

QUA′SIMO′DO, *Fr. pron.* kȧ′zē′mô′dȯ′. In Hugo's *Notre Dame de Paris,* the hunchback bell ringer of Notre Dame.

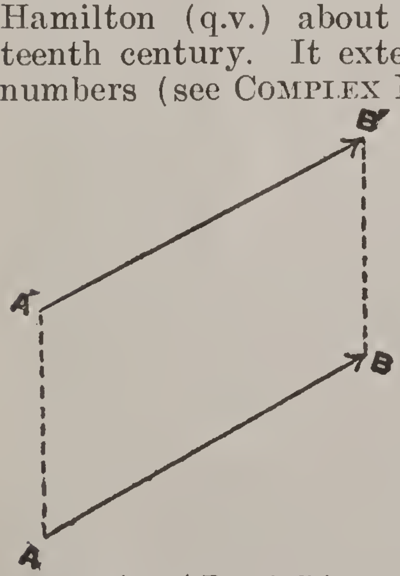
QUASKY. See OQUASSA TROUT.

QUASSIA, kwŏsh′ĭ-ȧ (Neo-Lat., from *Quassi,* or *Coissi,* name of a Surinam slave who used its bark as a remedy for fever). A genus of trees and shrubs of the family Simarubaceæ. *Quassia amara,* a native of tropical America, is a shrub 10 to 15 feet high, with racemes of bright-red flowers and large pinnate leaves with remarkably winged and pointed leafstalks. The wood, and particularly that of the root, is intensely bitter, and was formerly used in medicine under the names of quassia wood, bitterwood, bitter ash, etc. Cabinetwork made of it is free from insect attacks. The wood of *Quassia africana* (see BITTERWOOD) has been used to increase the bitterness of beer, being cheaper than hops. Beer so made is said to become muddy and flat.

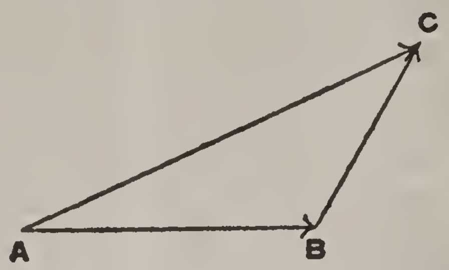
QUASSIA.

QUATERNARY PERIOD (Lat. *quaternarius,* consisting of four, from *quaterni,* four each, from *quattuor,* four). A term employed to characterize the Post-Tertiary strata. See PALEOLITHIC PERIOD; PLEISTOCENE PERIOD.

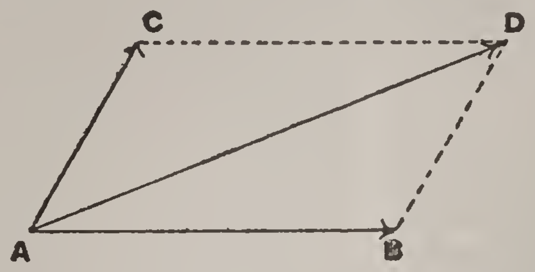
QUATER′NIONS (Lat. *quaternio,* group of four, from *quaterni,* four each). A branch of mathematics invented by Sir William Rowan Hamilton (q.v.) about the middle of the nineteenth century. It extends the idea of complex numbers (see COMPLEX NUMBER) to three-dimensional space, and besides being interesting as a branch of pure mathematics, it finds numerous applications in physics.



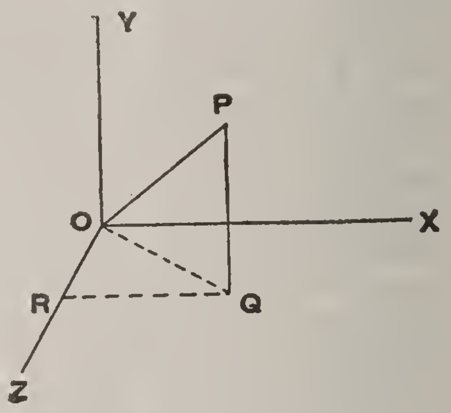
The first concept peculiar to the quaternion theory is that of vector (Lat. *vector,* carrier). A line segment *AB* has not only length, but also direction, and two line segments *AB, A′B′* are considered equal when they have the same absolute length and the same direction; e.g., in the parallelogram *ABB′A′*, *AB*, *A′B′* are called vectors because they are considered as carrying the points *A, A′* to the points *B, B′* respectively. It is therefore evident that a vector may be transported parallel to its original position without alteration in character, and hence that it may be considered as a symbol of translation.



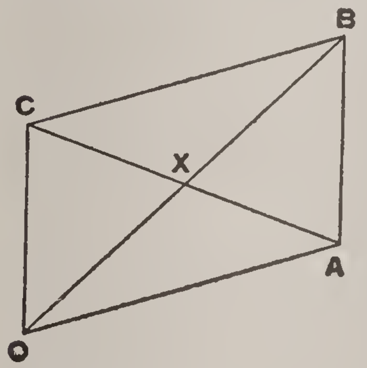
The sum of two vectors, *AB* and *BC*, is considered to be that vector which carries *A* to *C*, viz., *AC*.



This does not mean that the absolute value of *AB* plus that of *BC* equals that of *AC*, but that (direction being also considered) a force *AB* plus another *BC*, or *AB* + *AC* in the figure, equals the force *AD*.



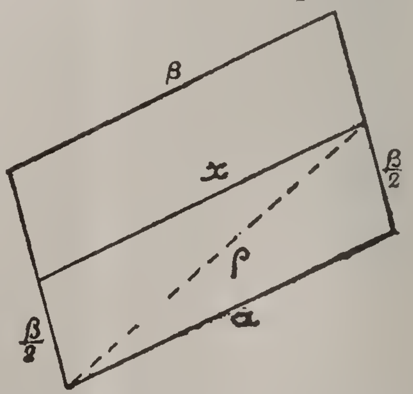
It is therefore evident that, with this definition of addition, the sum of the sides of a triangle or of any other closed polygon, considered as vectors, is zero. Therefore, if we have three given rectangular vectors, *OX, OY, OZ,* and *OP*, any other vector, *OP*, can be resolved into three vectors respectively parallel to (hence equal to parts of) *OX, OY, OZ*.



These are *RQ, QP, OR*; for $OR + RQ = OQ$, and $OQ + QP = OP$, as above explained. If, now, we lay off units on *OX, OY, OZ,* and designate them respectively by i_1, i_2, i_3 or, as is more common in English works, by i, j, k, and designate *OP* by ρ, we shall have $\rho = xi + yj + zk$, the absolute length of ρ being $\sqrt{x^2 + y^2 + z^2}$. These geometric ideas are elementary and had already been used by Möbius (q.v.) in his barycentric calculus before Hamilton invented quaternions. A few illustrations of their use will be of value. Let *OABC* be a parallelogram, the diagonals intersecting at *X;* then

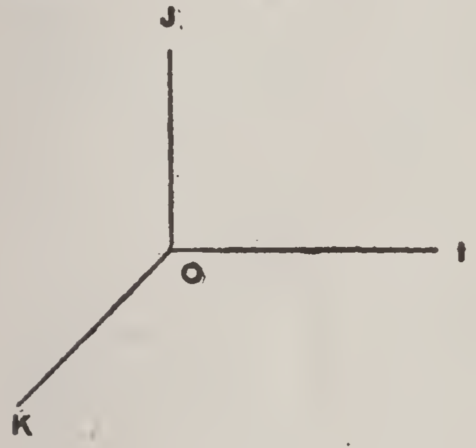
$$OX + XA = OA = CB = CX + XB;$$
$$\therefore OX - XB = CX - XA.$$

But vectors cannot be equal unless parallel, and *OXB* intersects *CXA*; hence in the last equation it is necessary that $OX - XB = 0 = CX - XA$, and hence that $OX = XB$ and $CX = XA$. It is thus proved that the diagonals of a parallelogram bisect each other.



Suppose α, β are two adjacent sides of a parallelogram, and *X* a line joining the mid-points of two opposite sides; then it is required to prove that x is parallel and equal to α. Drawing ρ it is seen that $\rho = \frac{\beta}{2} + x = \alpha + \frac{\beta}{2}$, whence $x = \alpha$, which (considering x and α as vectors) shows them to be equal and parallel.

Consider, now, what is meant by the ratio of two vectors *OA* and *OB*, or rather on how many distinct numbers this ratio depends. To change *OA* into *OB* requires in general, (1) a variation in length, or the application of a stretching factor; (2) a variation in direction, which requires three angles. Hence the required ratio depends upon four distinct numbers, whence the name "quaternion." The term may be defined as a number that alters a directed line segment in length and direction. The stretching factor is called the tensor and is indicated by prefixing *T* to a quaternion. The turning factor is called the versor and is indicated by prefixing *U*. A scalar is a quaternion whose product lies on the same line as the multiplicand, and hence is merely a positive or negative number. A vector is a quaternion that turns through an angle of 90°, or $\frac{1}{2}\pi$. The symbol for tensor of a quaternion is Tq; for versor of a quaternion, Uq; for scalar, Sq; for vector, Vq. The conjugate of a quaternion q, written Kq, has the same tensor, plane, and angle, but the angle is reversed. Suppose I, J, K to be unit lengths on rectangular coördinates as in the figure. These are so situated that a positive (counterclockwise) rotation, through 90°, of J about I brings J to K; a similar rotation about K brings I to J; a similar rotation about J brings K to I. Call the operator that turns K into J i; i.e., $i = \frac{K}{J}$, or $iJ = K$. Similarly let $j = \frac{I}{K}$, or $jK = I$; and $k = \frac{J}{I}$, or $kI = J$. It therefore follows that $-\frac{J}{K} = i, -\frac{K}{I} = j, -\frac{I}{J} = k$. Hence $-J = iK = i(iJ) = i^2J$, or $-1 = i^2$. Similarly $-1 = j^2$ and $-1 = k^2$. Also, since $iK = i(jI) = -ijI$, and $iK = -J = -kI$, it follows that $-ijI = -kI$, or that $ij = k$. Similarly $jk = i$, $ki = j$. A similar line of reasoning shows that $ji = -k$, $kj = -i$, $ik = -j$, whence



$$\begin{aligned} ij &= -ji = k, \\ jk &= -kj = i, \\ ki &= -ik = j. \end{aligned}$$

These relations, together with the consequent equation $ijk = -1$ and the relation already mentioned, that $i^2 = j^2 = k^2 = -1$, form the basis of the quaternion theory. They show at once that in this theory multiplication is not commutative.

To illustrate the application of quaternions, let $a = xi + yj + zk$ and $\beta = x'i + y'j + z'k$. Then $\alpha\beta = -(xx' + yy' + zz') + (yz' - zy')i + (zx' - xz')j + (xy' - yx')k$, and $\beta\alpha = -(xx' + yy' + zz') - (yz' - zy')i\ (zx' - xz')j - (xy' - yx')k$. Hence $S\alpha\beta = S\beta\alpha$ (i.e., the scalars are equal), $V\alpha\beta = -V\beta\alpha$ (i.e., the versors are opposites), and $\alpha\beta + \beta\alpha = 2S\alpha\beta$. Now $(\alpha+\beta)^2 = \alpha^2 + \alpha\beta + \beta\alpha + \beta^2 = \alpha^2 + 2\delta\alpha\beta + \beta^2$, which is the ordinary trigonometric formula for $c^2 = a^2 - 2ab \cdot \cos C + b^2$. Also $V(\alpha+\beta)(\alpha-\beta) = V\alpha^2 - V\alpha\beta + V\beta\alpha - V\beta^2 = -V\alpha\beta + V\beta\alpha$, because

$$V\alpha^2 = -V\alpha^2$$

and hence is zero; and this equals $= 2V\alpha\beta$. Taking the tensors of both sides of the equation $V(\alpha + \beta) = -2V\alpha\beta$, we have the theorem: The parallelogram whose sides are parallel and equal to the diagonals of a given parallelogram has twice the area of the latter. Furthermore $\delta(\alpha + \beta)(\alpha - \beta) = \alpha^2 - \beta^2$, and vanishes only when $\alpha^2 = \beta^2$, or $\tau\alpha = \tau\beta$; whence the diagonals of a parallelogram are perpendicular to each other when and only when the sides are all equal. The chief application of quaternions, however, is in physical problems, and for these reference must be made to works upon the subject. It is evident that the complex number admits of still further generalization, to the form

$$a = a_1i_1 + a_2i_2 + a_3i_3 + \ldots\ a_{n-1}i_{n-1} + a_ni_n.$$

This theory has been developed by Weierstrass (*Göttinger Nachrichten*, 1884–86), Schwarz, Dedekind, Hölder, and others.

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QUATRAIN, kwŏt′rȧn (Fr. *quatrain*, from *quatre*, from Lat. *quattuor*, four). A name given (originally by the French) to a little rhymed poem of four verses (lines), or even sometimes to four verses of a longer poem, such as a sonnet, if they contain a complete idea within themselves. Epigrams, epitaphs, proverbs, etc., are often expressed in quatrains. Fitzgerald's famous version of *Omar Khayyam* is written in this verse form.

QUATRE-BRAS, kȧ′tr′-brȧ′. A village in the Province of Brabant, Belgium, about 19 miles south by east of Brussels. It is situated at the intersection of the great roads from Brussels to Charleroi and from Nivelles to Namur, whence its name. On June 16, 1815, two days before the battle of Waterloo, Quatre-Bras was the scene of a desperate and sanguinary battle between the British and their German allies under Wellington and the French under Ney, in which the former were victorious. The severe defeat of Blücher the same day at Ligny rendered Wellington's hard-won victory almost valueless; and the British commander retired next morning through Jemappes to Waterloo in order to keep up his communication with the Prussian army. The Duke of Brunswick, commanding the German troops, was killed in this battle. See Waterloo.

QUATREFAGES DE BRÉAU, kȧ′tr′-fȧzh′ de brȧ′ȯ′, Jean Louis Armand de (1810–92). A French naturalist, born at Berthezène (Gard).

He was educated at Tournon and Strassburg (M.D., 1833), began practice at Toulouse, and established there the *Journal de médecine et de chirurgie de Toulouse.* From 1833 to 1838 he was professor of chemistry, and from 1838 to 1840 professor of zoölogy in the faculty of sciences of the University of Toulouse. He then went to Paris, where he designed plates for the *Règne Animal Illustré,* wrote for the *Revue des Deux Mondes,* in 1850 was appointed professor of natural history at the Lycée Napoléon, and in 1855 professor of anthropology at the Musée d'Histoire Naturelle. He was elected to the Academy of Sciences in 1852. He was a noteworthy teacher and became particularly known for his anthropological investigations and his studies of the invertebrates, especially the annelids. He published many works, of which the most important was *Histoire générale des races humaines* (2 vols., 1886–89). His *La race prussienne* (1871) involved him in a scientific controversy with Virchow.

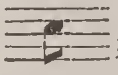
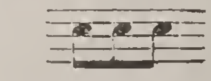
QUATREFOIL, kăt′ẽr-foil′ (OF. *quatrefeuille,* from *quatre,* from Lat. *quattuor,* four + *feuille,* from Lat. *folium,* leaf). An heraldic bearing meant to represent a four-leaf flower resembling a primrose. See Heraldry.

QUATREMÈRE, kȧ′tr′mâr′, Etienne Marc (1782–1857). A French Orientalist, born in Paris. He studied at the Collège de France and in 1807 was employed in the Bibliothèque Impériale. In 1809 he became professor of Greek in the College of Rouen, in 1815 was elected a member of the French Institute, in 1819 was called to the chair of Hebrew in the Collège de France, and in 1838 was made professor of Persian in the school for modern Oriental languages. In his *Recherches critiques et historiques sur la langue et la littérature de l'Egypte* (1808) he demonstrated that Coptic is the true representative of ancient Egyptian. His geographical and historical works are of great value, especially his *Mémoires géographiques et historiques sur l'Egypte* (1811); his *Histoire des sultans mamlouks* (1837–45), translated from the Arabic of Makrizi; and his *Histoire des Mongols de la Perse* (1836), from the Persian of Rashid-Eddin. He contributed valuable articles in the *Journal Asiatique* and the *Journal des Savants,* and edited the Arabic text of the Prolegomena of Ibn-Khaldun (1858). His *Mélanges d'histoire et de philologie* was published after his death by Barthélemy de Saint-Hilaire. Quatremère's library (45,000 volumes), his Arabic manuscripts, and his manuscript notes are now in the royal library at Munich.

QUATREMÈRE DE QUINCY, kăɴ′sē′, Antoine Chrysostome (1755–1849). A French archæologist and politician, born in Paris. He was actively concerned in the events of the French Revolution and occupied various political positions during the Republic, Consulate, and Empire. He became intendant of arts and public monuments in 1815, perpetual secretary of the Académie des Beaux-Arts in 1816, editor of the art department in the *Journal des Savants,* and was deputy from 1820 to 1822. In 1824 he became professor of archæology at the National Library. His chief works are: *Dictionnaire de l'architecture* (3 vols., 1795–1825); *Jupiter olympien, ou l'art de la sculpture antique* (1814); *Histoire de la vie et des ouvrages de Rafaël* (1824; 2d ed., 1833); *Monuments et ouvrages d'art antique restitués* (2 vols., 1829); *Histoire de la vie et des ouvrages des plus célèbres architectes du Xe siècle jusqu'à la fin du XVIIIe* (1830); *Canova et ses ouvrages* (1834); *Histoire de la vie et des ouvrages de Michel-Ange Buonarotti* (1835).

QUATRE-VINGT-TREIZE, kȧ′tr′-văɴ-trāz (Fr., ninety-three). The last novel of Victor Hugo (1874) and one of his best works. The action takes place principally in La Vendée in 1793.

QUATTROCENTO, kwät′trō-chĕn′tō (It., four hundred). A term applied in Italian art to the period and to the art of the fifteenth century, i.e., whose dates are in the four-hundreds, disregarding the first figure. The artists of this period are designated *quattrocentisti.* The greater part of the fifteenth century is covered by the early Renaissance (see Renaissance Art), though in its earlier years mediæval influences and traditions were still strong, while its later years show the rapid maturing of the arts which pass gradually into the splendid efflorescence of the *cinquecento*—the sixteenth century. See Cinquecento.

QUAVER. In music, an eighth note. Its measure is equal to half a crotchet, one-fourth of a minim, or one-eighth of a semibreve. It is represented thus: ; or when two or more are conjoined, thus: .

QUAY, kē. A landing place or wharf for unloading vessels, often supplied with mechanical devices for the loading and discharging of cargoes. Quays usually are of masonry, though they may be constructed of wood or iron on piles, but in such cases the term "wharf" is generally applied. In Europe such structures have been more permanently constructed than in the United States, and often elaborate systems of railways connect the various docks with each other and with the principal railway systems. There are also steam, hydraulic, or electrical cranes to facilitate the handling of the cargoes, and in the best docks a vessel comes alongside of the quay and the cargo is removed directly to or from railway cars or warehouses. See Dock; Harbor; Wharf.

QUAY, kwā, Matthew Stanley (1833–1904). An American politician, born at Dillsburg, York County, Pa., Sept. 30, 1833. He graduated at Jefferson College in 1850, studied law under Judge Sterret and was admitted to the bar in 1854. During the Civil War he was successively assistant commissary-general of the State, colonel of the 134th Pennsylvania Regiment, State military agent at Washington, and military secretary to Governor Curtin. Congress awarded him a medal for gallantry at Fredericksburg. Quay was a member of the State Legislature (1865–67), Secretary of State for Pennsylvania (1872–78), Recorder of Philadelphia (1878–79), again Secretary of State (1879–82), was elected State Treasurer in 1885, and was chosen United States Senator in 1887. From 1869, when he had served as secretary of the Republican State Committee, until his death, he was the most influential Republican politician in Pennsylvania. As chairman of the executive committee of the Republican National Committee in 1888 he conducted a Presidential campaign which resulted in triumph to his party. Reëlected to the

Senate in 1893, Quay failed to succeed himself in 1899 because of a deadlock which lasted throughout the session of the Legislature. His failure was partly due to an accusation that he had been instrumental in the misapplication of public funds deposited in the People's Bank, in which he was interested. He was tried but was acquitted. Afterward he was appointed Senator ad interim by the Governor, but the Senate refused to admit him. However, he was nominated to succeed himself by the Republican State Convention, and in 1901 was reëlected for the term to expire in 1905. In 1902–03 he attracted attention by his championship of the admission of New Mexico, Oklahoma, and Arizona to statehood, and by his opposition to the Panama Canal Treaty. Quay died May 28, 1904. His remarkable skill and finesse in politics were generally recognized, but he was charged with being the boss of a reactionary and oftentimes corrupt machine. So strong was his influence, however, that his methods were followed by the succeeding political generation, and his record was frequently mentioned in the anti-Boss-Rule campaign of 1912. "Boss" Quay's political principles and actions stood in contrast to an unusually attractive personality.

QUAYLE, kwāl, William Alfred (1860–). An American Methodist Episcopal bishop, educator, and writer. He was born at Parkville, Me., soon after his people came to the United States from the Isle of Man. Graduating in 1885 at Baker University, Baldwin, Kans., he remained as adjunct professor of ancient languages, was assigned the chair of Greek language and literature in 1887 and from 1890 to 1892 served as president of the university. He entered the pastorate in the St. Louis Conference on his resignation, and afterward was pastor of large churches in Kansas City, Indianapolis, and Chicago. In 1908 he was elected Bishop. As a lecturer he became widely known. His writings include: *The Poet's Poet and Other Essays* (1897); *A Hero and Some Other Folks* (1900); *The Blessed Life* (1901); *The Gentleman in Literature* (1902); *Hero: Jean Valjean* (1902); *King Cromwell* (1902); *In God's Out of Doors* (1902); *Eternity in the Heart* (1904); *The Prairie and the Sea* (1905); "Lowell," in *Modern Poets and Christian Teaching* (1906); *God's Calendar* (1907); *The Pastor Preacher* (1910); *Laymen in Action* (1912); *The Climb to God* (1913); *Poems* (1914).

QUEBEC, kwē-bĕk′, formerly Lower Canada. One of the eastern provinces of the Dominion of Canada. Its greatest east and west measurement is nearly 1000 miles, that from north to south about 1200 miles. It reaches to Hudson Strait on the north and on the east to Labrador (Map: Canada, P 7). There are 690,865 square miles of land area and 15,969 of water area, exclusive of the Gulf of St. Lawrence and the territorial seas. The Federal Act of 1912 gave Quebec 354,961 square miles of territory at the expense of the Northwest Territories (q.v.).

Physical Characteristics. Physically and geologically Quebec is divided into three parts. Almost all the vast region to the north of the St. Lawrence is a portion of the so-called Laurentian plateau, which belongs to the most ancient geological era (Archean). This is a barren, rocky, undulating region, the hills ofttimes standing out in great boldness, but nowhere reaching a high elevation. The highest portion, the Height of Land, constituting the watershed between the river systems, scarcely exceeds 1000 feet in the west, but becomes gradually higher to the eastward, averaging 1700 feet in the centre of what was formerly the Labrador Peninsula, now the northern part of the province. The shores of Hudson Bay are rocky, indented by many deep bays and skirted by a large number of rocky islands. The second division consists of the narrow strip of lowlands on either side of the St. Lawrence west of Quebec. Here the general level rises but a few hundred feet above that of the sea, except where the later strata are pierced by rocks of igneous formation, which in a few instances rise quite high, Mount Royal at Montreal being the best known of these. To the eastward of these lowlands the strata have been violently upheaved, the line of dislocation running from Lake Champlain to Quebec, and thence following the estuary of the St. Lawrence, the disturbed area occupying the greater portion of Quebec south of the St. Lawrence and constituting the third division. It is a part of the so-called Acadian region. This is simply the northern extremity of the great Appalachian mountain chain. This portion of Quebec is broken and hilly throughout, rising nearly 4000 feet in Sutton Mountain in the Notre Dame Range. Rivers draining into Hudson Bay are the Harricanaw, Nottaway, Rupert, Eastmain, Big Whale, Little Whale, and Nastapoka. The Payne, Leaf, Kaniapiskaw, Whale, and George empty into Ungava Bay. The North, Fraser, Naskaupi, Hamilton or Grand, with Grand Falls (q.v.), flow into the Atlantic Ocean.

The southern portion of the province is drained by the St. Lawrence River system. This river has been the all-important factor in the history and development of the province. The numerous southern tributaries are short, the northern tributaries longer, but, owing to the frequent falls and rapids along their courses, they are of little value to navigation. These features, together with the precipitous channels through which the streams flow, and the ruggedness of the adjacent highlands, combine to produce scenery which annually attracts thousands of tourists, the Saguenay River being the most frequented. The most important southern tributary is the Richelieu. It drains Lake Champlain. The region north of the St. Lawrence drains in all directions from the Height of Land and contains numerous water-covered areas which vary from swampy lands to lakes of considerable size, the St. John, the Mistassini, Minto, Payne, Clearwater, Seal, Apiskigamish, Melville, and Michikamaru being the most important. In the southern part of the province are Lakes Metapedia, Memphremagog, Timiskaming, an extension of the Ottawa River, and Megantic. The island of Anticosti, at the mouth of the St. Lawrence, Bonaventure, a fishing station east of the Gaspé Peninsula, and the Magdalen group, north of Prince Edward Island, are the most important of the large number of islands which belong to the province.

Climate. The winters in southern Quebec are long and cold; the summers warm, though not to excess. The mean annual temperature ranges from 45° at Montreal to 29° in southern Labrador. The air is in general remarkably dry and free from fog and therefore extremely healthful and bracing, not even the extremes of the winter's cold being intolerable. The deep winter snows last from November to April (except in the farthest district south). In the extreme north the country extends into the Arctic climatic province, characterized by a brief warm summer and a long cold winter.

Mineralogy and Mining. The province is favored with large mineral resources, but has not yet reaped any great benefit therefrom. Like Ontario, Quebec is unfortunate in not possessing coal. The tariff levied by the United States practically prohibits the exportation of ore into that country. The southeast portion of the province is highly productive of mineral wealth and has become noted for its asbestos mines, which yield 80 per cent of all the asbestos marketed in the world. In 1913 the product equaled $3,849,925 in value. Iron is mined in the region east of the Richelieu River and is found at various points along the north bank of the St. Lawrence and farther west in the region of Ottawa. For a long time small quantities of gold have been taken from the gravels of the Chaudière River. The southeast townships abound in cupriferous pyrites, and considerable copper is mined, the product being used for the manufacture of sulphuric acid. In 1913 the copper ore was valued at $866,774. Plumbago is found near Ottawa, and phosphate and mica exist to the northward. Lead is found farther west and north along the course of the Ottawa River. Some graphite and small quantities of gems of inferior quality have been placed upon the market. In 1913 the output of cement was valued at $3,361,292. The limestone of the eastern counties has been liberally drawn upon for building purposes, but its greatest use and service have been in the production of lime, the annual output of which has reached over $450,000. Granite is quarried in the counties adjacent to Vermont and New Hampshire, while just to the north of this section slate is quarried in considerable quantities. Peat is found in inexhaustible quantities, but has not yet come into use. The total mineral output for the calendar year 1914 was valued at $12,259,637.

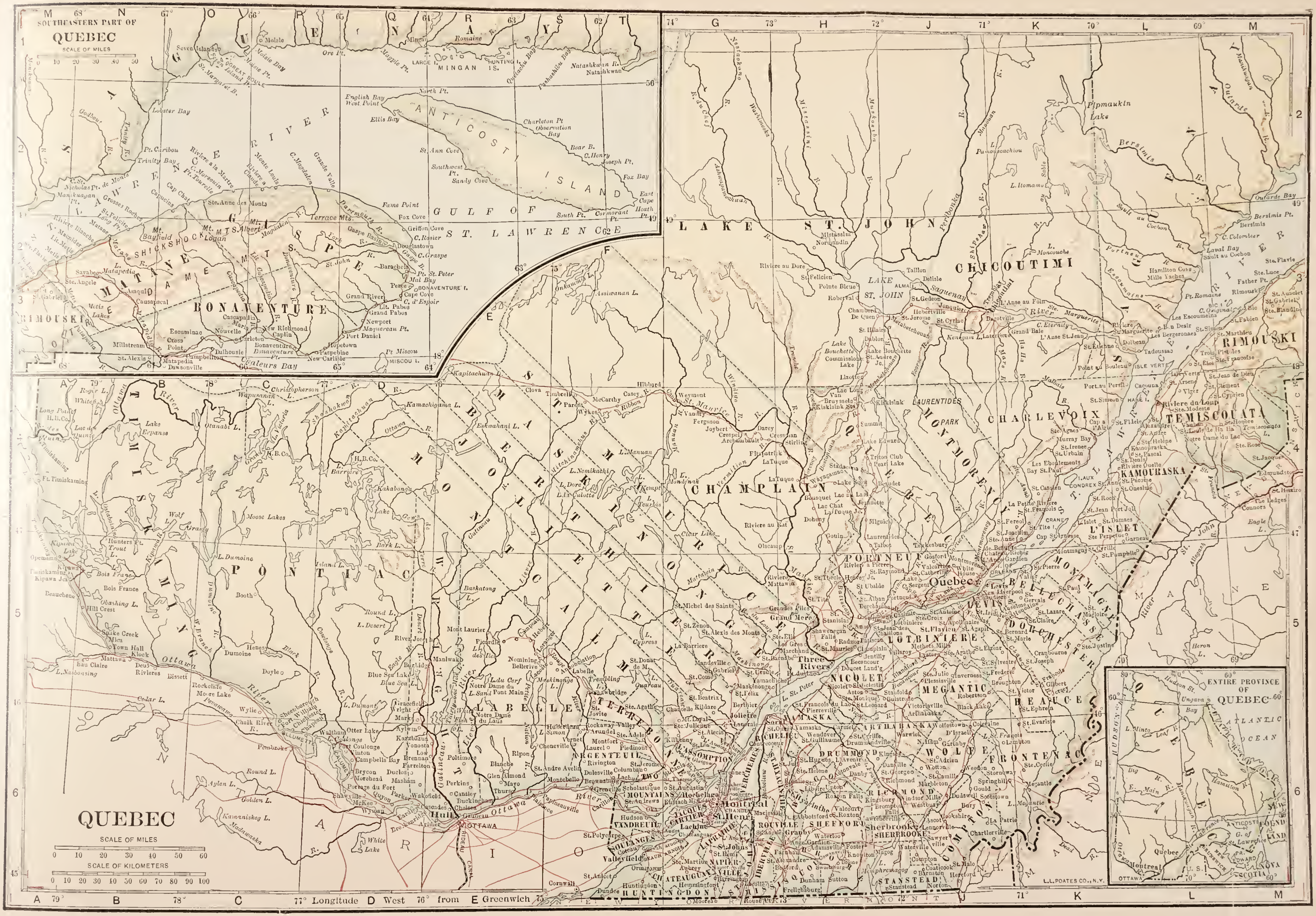
Fisheries. Fishing is an important occupation, carried on largely in the estuary and Gulf of the St. Lawrence. In common with the other provinces Quebec enjoys the benefits of the bounty given by the Dominion government for engaging in sea fishing. Latterly the returns show that the number of men engaged in boat fishing has annually exceeded 9500. The catch in 1913 was $1,988,241 in value, the income from the cod fisheries constituting more than one-third of this amount. Lobster, herring, salmon, and mackerel are next in importance. Whales are numerous in Hudson Bay and on the Atlantic seacoast.

Fauna and Flora. Quebec still furnishes the world's market with a valuable quota of furs. The fauna of the province deserve consideration chiefly from this point of view. The moose, the caribou or reindeer, the red deer, weasel, wolf, bear, lynx, seal, muskrat, and raccoon are important, as are also the fox, beaver, marten, otter, and mink. Fox farming has become a profitable industry. The beaver, otter, and marten have become rarer. There are about 300 species of birds, among which the ducks and teal, Canada goose, wild goose, plover, and partridge are objects of sport.

In the Ottawa and St. Lawrence valleys and the highlands south of the St. Lawrence there is a mixed forest such as is typical of the New England States to the south. Here are found maples, oak, ash, beech, butternut, elm, and other hardwoods, together with the red and the white pine, the cedar, spruce, birch, and other varieties of evergreens. The region south of the St. Lawrence still contains extensive valuable forest areas, as is the case with the Upper Ottawa region. In the highland region to the north the sub-Arctic species of flora prevail, and there are but few varieties, in marked distinction from the southern section. The best forest land lies south of the watershed, and, though not equal in value to the forests of northern and central Ontario, is yet very valuable and is to-day the great lumbering region of Quebec. The tamarack and the spruce occupy the wet boggy lands in the southern portion of this region, becoming common also on the drier lands farther north. The Banksian pine flourishes in the sandy and rocky soil, but is inclined to be scrubby as compared with the noble proportions it attains farther west. It is estimated that over one-fourth the area of the province is still forest or woodland, being about 130,000,000 acres of forest, with a total of 174,956 square miles of forest reserves.

The fruit trees of temperate regions thrive in the orchards of the settled parts of the province, but especially in the central part of the St. Lawrence valley.

Agriculture. Farming is the most important occupation, though cultivation is confined largely to the fertile river valleys. In the cultivated portions the soil is loamy and of great fertility. In the vast stretch of highland north of the St. Lawrence it varies greatly in richness, much of the region being either swampy or rocky and barren, the barrenness increasing to the northward. The townships adjacent to Vermont resemble that State in physical characteristics, being better adapted to stock raising than to farming. In 1911 the province had an occupied acreage of 15,613,267 acres and an estimated arable acreage of 43,745,000. In 1914 the value of field crops was $99,279,000. According to official Dominion statistics in 1914 the yield of hay and clover in that year was valued at $53,196,000; 1,327,000 acres of oats produced 42,119,000 bushels, valued at $24,429,000; 102,000 acres of buckwheat, 2,477,000 bushels, valued at $2,056,000; 99,000 acres of mixed grains, 2,970,000 bushels, valued at $2,287,000; 85,000 acres of barley, 2,261,000 bushels, valued at $1,944,000; 115,000 acres of potatoes, 21,811,000 bushels, valued at $9,161,000; 10,500 acres of turnips, 3,446,000 bushels, valued at $1,275,000. Parts of the province are noted for their superior apples and plums, while the hardy varieties of smaller fruits grow everywhere. The average annual value of the maple-sirup product is $1,600,000. Stock raising received great attention. On June 30, 1914, the province possessed 372,009 horses, 733,476 milch cows, and 625,598 other cattle, 571,287 sheep, and 634,569 swine. According to the report of the Dominion Dairy Commissioner for 1913 there were in that year in the province 894 cheese factories, 576 creameries, and 698 combined factories making both butter and cheese. Much attention is given to dairying, especially to improving the herds of cows. In the eastern townships much of the cream produced is marketed in the United States. South of the watershed the summers are sufficiently


SOUTHEASTERN PART OF QUEBEC
SCALE OF MILES
0 10 20 30 40 50
GULF OF ST. LAWRENCE
ANTICOSTI ISLAND
MINGAN IS.
RIVER ST. LAWRENCE
GASPE
BONAVENTURE
MATANE
RIMOUSKI
SHICKSHOCK MTS.
Chaleurs Bay
QUEBEC
SCALE OF MILES
0 10 20 30 40 50 60
SCALE OF KILOMETERS
0 10 20 30 40 50 60 70 80 90 100
LAKE ST. JOHN
CHICOUTIMI
CHARLEVOIX
MONTMORENCY
LAURENTIDES PARK
TEMISCOUATA
KAMOURASKA
L'ISLET
MONTMAGNY
BELLECHASSE
DORCHESTER
BEAUCE
LOTBINIERE
MEGANTIC
NICOLET
ARTHABASKA
WOLFE
FRONTENAC
COMPTON
SHERBROOKE
STANSTEAD
RICHMOND
DRUMMOND
SHEFFORD
CHAMPLAIN
PORTNEUF
QUEBEC
Quebec
Three Rivers
Montreal
Sherbrooke
Hull
OTTAWA
ST. MAURICE
MASKINONGE
JOLIETTE
BERTHIER
L'ASSOMPTION
TERREBONNE
ARGENTEUIL
TWO MOUNTAINS
LABELLE
OTTAWA
PONTIAC
TIMISKAMING
HUNTINGDON
CHATEAUGUAY
NAPIERVILLE
VAUDREUIL
SOULANGES
MAINE
VERMONT
N.H.
ONTARIO
77° Longitude West 76° from Greenwich
ENTIRE PROVINCE OF QUEBEC
ATLANTIC OCEAN
Hudson Bay
Ungava Bay
NEW BRUNSWICK
NOVA SCOTIA
NEWFOUNDLAND
U.S.
L.L.POATES CO., N.Y.

warm and the soil in many places is sufficiently fertile to guarantee an extensive agricultural development. This is especially true of the Lake St. John and the Upper Ottawa regions.

Commerce, Transportation, and Manufactures. The navigable St. Lawrence River has been the determining factor in the development of Quebec. The largest ocean steamers ascend the river as far as Montreal, 500 miles from its mouth. The shipping industry of this port has made it the metropolis of Canada. Here is collected almost the whole of the interior Canadian product which is destined for foreign shipment, to which are added also large quantities of food products from the northern United States. The navigation of this river has been greatly improved (as has been also that of its north and south tributaries, the Ottawa and the Richelieu) by the construction of canals at points where their courses are interrupted by rapids. (For canals and foreign shipments, see CANADA.) The principal export products of Quebec are lumber, timber, beef, apples, and dairy products—butter and cheese. The exports for the fiscal year 1913 amounted in value to $147,723,907, and the imports to $187,301,493. Trade with the outside world is almost solely through Montreal, Quebec, St. John's, and Coaticooke. The principal imports are sugar and manufactures of cotton, iron, steel, copper, and wood.

The construction and maintenance of railroads have been aided by the Dominion, provincial, and municipal governments in accordance with settled Canadian policy. The mileage in 1914 was 4043, less than half that of Ontario. Most of the lines are south of the St. Lawrence. The only line running into the northern interior is the one from Quebec to Lake St. John. The National Transcontinental Railway, the eastern portion of the Grand Trunk Pacific, runs from the city of Quebec westerly through the province, passing the northern shore of Lake Abitibi, which lies across the boundary between Ontario and Quebec. Shipbuilding, which was formerly an important industry, has almost entirely ceased. Logs used to be shipped in the rough to British ports, but now numerous saw mills have been established, and the timber is sawed into lumber before shipment. The presence of tanning barks, notably the hemlock, has given rise to an extensive tanning industry. The spruce is being largely manufactured into wood pulp and its products. In 1913 the pulp wood produced was valued at $4,107,689. Boots and shoes are made at Montreal and Quebec. Cottons are also manufactured. The manufacture of matches, potash, and other chemical products is of importance. A number of the river rapids have been utilized in the generation of electric light and power. In 1913 there was an estimated capital invested in manufactures of $378,441,000, employing 183,125 persons, with a product valued at $406,167,950. Eleven industries in 1910 had an annual output of over $11,000,000 each. These were log products, $26,669,747; boots and shoes, $22,662,178; cottons, $16,741,409; butter and cheese, $16,156,986; railway cars (repairs), railway cars (building), clothing, tobacco and its manufactures, gristmill products, paper and lumber products.

Government. A Lieutenant Governor, appointed by the Governor-General of Canada in Council, is at the head of the Provincial government. The Lieutenant Governor is assisted by an executive council of nine members, which is responsible to the elective assembly. The Legislature consists of a nominative, legislative council of 24 members and an elective assembly of 82 members. The province sends 65 members to the Dominion House of Commons and 24 to the Dominion Senate. A public-utilities commission of three members was created in 1910 and given jurisdiction over all public-utility corporations not under federal charter.

Finances. The principal sources of revenue are the subsidy from the Dominion government, which amounted in 1913–14 to $2,027,927; lands and forests, $1,777,220; duties on successions, $1,604,479; hotel and shop licenses, $1,027,596; taxes on commercial corporations, $925,093; law stamps and fees, $479,092. The principal items of expenditure are the payment of interest on the provincial debt, which amounted to $1,204,743 on June 30, 1914; administration of justice, $1,025,330; public instruction, $1,435,515; public health works, $793,850; civil government, $582,431; asylums and charities, $748,806. The total receipts for the year ended June 30, 1914, were $13,343,306 and total expenditures, $14,221,496. The ordinary revenue of the year was $9,000,374. The provincial net funded debt on June 30, 1914, was $24,579,166, or $12.26 per capita.

Population. The population increased from 1,488,535 in 1891 to 1,648,898 in 1901 and 2,003,232 in 1911. The per cent of increase in population from 1891 to 1901 was much greater than in any of the other eastern provinces and was made in spite of a very heavy emigration into the New England States. The gain is accounted for by the unusually large birth rate, the average size of the families being 5.5. The Indians numbered 9993 in 1911, most of whom were well advanced in civilization. This does not include the Indians in the territory added from the Northwest Territories (q.v.) in 1912. Quebec was originally settled by the French, whose descendants still form a large majority of the population. Their race has remained practically intact: it is still French in language, manners, and temperament. This fact is of first importance when the government of the province is considered and is the predominant factor in almost every phase of its social life. The eastern townships received a large number of United Empire Loyalists from the American Colonies during the Revolution. In 1911 the population of Montreal was 470,480 and of Quebec, the capital, 78,710. Other cities were Maisonneuve (18,684), Hull (18,222), Sherbrooke (16,405), Westmount (14,579), and Three Rivers (13,691). Montreal is the largest city in the Dominion, and the large number of racial elements represented give it a cosmopolitan air. Of the total population of the city, in 1911, 298,878 were French.

Religion. Quebec was first settled by French Catholics and was the centre of the great missionary activity of the Jesuits. The Catholic faith still continues strongly predominant, its adherents outnumbering the Protestants more than 6 to 1. They constitute two-thirds of the total Catholic population of the Dominion. In 1911 the Roman Catholics numbered 1,724,683; Anglicans (Episcopalians), 102,684; Presbyterians, 64,125; Methodists, 42,444; Lutherans, 30,268.

Education. The educational system is unlike that of any other Canadian province. There is a Council of Public Instruction, with a superintendent at the head. But the administration is represented by two committees, Catholic and Protestant, having the care of the schools of the respective faiths, prescribing such religious instruction as they see fit, and receiving proportionate support from the public funds. The educational establishments of the province are divided into three kinds: (1) primary schools, including elementary, model or intermediate, and higher or academic; (2) classical colleges and universities; (3) special schools, such as technical schools, schools of art, etc. In 1912–13 there were 6738 primary schools, of which 5860 were Catholic and 878 Protestant; and 20 Catholic classical colleges. There were 411,774 primary pupils, of which 362,934 were Catholic and 48,850 Protestant. The classical colleges had 8189 pupils. Of special schools there are the Polytechnic School and School of Higher Commercial Studies at Montreal, 12 schools of arts and manufactures, 4 schools for deaf mutes and the blind, 3 agricultural schools, and, besides that at Oka, 39 domestic science schools, and 75 night schools. There are 11 normal schools. (For higher educational institutions, see CANADA.) The expense of the public schools averages about $11 per enrolled pupil. About 14 per cent of this is met by government grants, the rest being raised by assessment of the people.

Charities. In 1914 the provincial asylums for the insane at Montreal, Quebec, and other places contained 4464 inmates; reformatory schools had 457 inmates, and the industrial schools 450 inmates.

History. (For the period preceding permanent settlement, see CANADA.) In 1608 Champlain laid the foundations of the colony of Quebec; and as a result of his 27 years of activity in exploring the St. Lawrence and the Great Lakes as far west as Huron, in cultivating the friendship of the Canadian Indians, and in curbing the power of the Iroquois, there were in Quebec at the time of his death, on Christmas Day, 1635, some 150 colonists, who derived a precarious existence largely from the fur trade. (See CHAMPLAIN, SAMUEL DE.) Champlain's efforts were supplemented in a degree by the work of the Recollet missionaries, who arrived in 1615, and the Jesuits, who came in 1625; but the pitiable condition of the colony for the next 30 years, during which period occurred the failure of the Hundred Associates under Richelieu, clearly proved that no true elements of colonial prosperity could be expected from the initiative of individual Frenchmen. During this period, in 1642, came the founding of Montreal and the laying of the foundation of those religious establishments that under Monseigneur de Laval, the first Roman Catholic Bishop of Canada, assumed the commanding position which they continued to hold while French domination lasted. When, in 1663, Canada was made a royal government, its French population amounted to only 2500, largely centred at Quebec, Montreal, and Three Rivers.

The coming of the Marquis de Tracy in 1665, followed by his successful campaigns against the Mohawks, two years later, was the signal for a more rapid immigration. Under the intendant Talon (q.v.) the colony enjoyed a moderate degree of prosperity. Under the administration of the Count de Frontenac (1672–82, 1689–98) the Iroquois were led to respect the French power, while the area for the fur trade was greatly extended; and to accomplish this double purpose Fort Frontenac (Kingston) was established as an outpost on Lake Ontario. In 1690 an English expedition under Sir William Phips was defeated before Quebec. The total immigration for the year 1663 to 1713, largely from the French provinces of Perche and Normandy, did not exceed 6000, and the population of the territory included within the present Province of Quebec at the latter date was less than 20,000; but Frontenac had made Canada a power to be feared by its English neighbors. The system of seigneurial tenure had built up the nucleus of an agricultural community on the banks of the St. Lawrence, but the vast forests of the West still attracted the more vigorous spirits of the population and rendered a settled society almost impossible.

The religious orders were often in sharp conflict with the government officials, yet their influence on the life of the colony was generally helpful. The Jesuit College at Quebec, founded in 1635, antedated Harvard, and doubtless was largely responsible for the evidence of culture in the cities noted a century later by the traveler Charlevoix and the Swedish botanist Kalm.

The memorable battle on the Plains of Abraham, Sept. 13, 1759, resulting in the fall of Quebec, which was followed by that of Montreal in the next year, brought Canada under the dominion of England. At that time, of the 60,000 French in the valley of the St. Lawrence, 8000 were gathered at Quebec, 4000 at Montreal, and 1000 at Three Rivers, the total population of the three hardly equaling that of Boston. These three cities formed the centres of the judicial districts into which the English divided the colony, with a Superior Council at Quebec. During the 11 years preceding the Quebec Act (q.v.) of 1774 the small English minority petitioned for themselves a representative system, wholly unsuited to the French population, which would have placed all power in their hands. Though their action gave rise to a race antagonism, the evident policy of both the home government and the local officials was to deal justly with their new subjects and thus secure their good will. For this reason, largely, all attempts of emissaries from the Continental Congress to stir up the Canadians against England and the expedition of Montgomery and Arnold in 1775 alike failed of their object. Much of the credit of this result is due to the wise rule of Sir Guy Carleton (afterward Lord Dorchester), the military governor.

By the end of the American Revolutionary War at least 10,000 exiled Loyalists had sought the valley of the St. Lawrence and the region bordering upon the Lakes beyond, and they now petitioned for a separate western district. By the terms of the Constitutional Act of 1791 their prayer was granted, but the period down to 1812 was marked by a growing race hostility in Lower Canada, as Quebec was then called. During the War of 1812–14 between the United States and Great Britain the province suffered little; on the contrary, the general effect was a greater unity of sentiment among the two leading elements of its population, although up to 1836 the relations between the elective assembly and the royal governors were far from cordial. This fact, however, led but few French-Canadians of prominence to take part in the Rebellion of 1837–38, which resulted in the collapse of Papineau's scheme of "La Nation Canadienne." (See PAPINEAU, LOUIS JOSEPH.) In the latter year the population of Lower Canada approached 300,000, of whom one-fourth were of British origin, and this element largely controlled the industry of the province. Quebec and Montreal each boasted a population of 35,000.

Following the Rebellion, the two provinces were again united for general purposes by the Act of 1841, and a Parliament of Two Houses, a nominative legislative council and an elective legislative assembly, was constituted. As there was some opposition to the provision that all debates in this Parliament must be conducted in English, this was shortly repealed in favor of the French representatives from Quebec. By the Act of 1867 Quebec became a part of the Dominion of Canada, of which the course of her leaders has made her a conservative though consistently loyal member, despite scattered attempts to stir up race feeling during the Riel Rebellion of 1885 (see RIEL, LOUIS) and the Boer War. In 1888 an Act was passed compensating the Jesuits for confiscation of their estates, with a resulting agitation whose outcome was the Equal Rights Party. (See PARTY NAMES.) An alternation of Conservative and Liberal administrations until 1905 brought no great features of provincial policy on which both parties were not substantially agreed, however opposed in carrying them into effect. Extension of the provincial boundaries, increase of the Dominion subsidy, improvement of educational methods, and a firm maintenance of French-Canadian rights as guaranteed by the Quebec Act were characteristic of both parties. In 1905 Sir Lomer Gouin became Liberal Premier and put into force a progressive policy. His administration has done much to develop the resources of the province. See CANADA.

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QUEBEC. The capital of the Province of Quebec and the oldest city in Canada, situated at the confluence of the St. Lawrence and St. Charles rivers, on a promontory named Cape Diamond, and on the Canadian Northern, the Intercolonial, the Grand Trunk, the Canadian Pacific, the Quebec Central, and the Quebec and Lake St. John railroads, in lat. 46° 48′ N., long. 71° 12′ W., 180 miles northeast of Montreal and 430 miles north-northeast of New York (Map: Quebec, G 4). It is a port of entry for Atlantic steamships in summer. A steam-ferry service connects the city with Lévis on the opposite bank of the St. Lawrence. An immense steel bridge across that river was in course of construction in 1915. Quebec's picturesque position, and the fact that its historical sites have never been defaced and altered, make it one of the most romantic and interesting cities in North America. It resembles, especially in the lower town, a mediæval European rather than a New World city and, owing to its impregnable aspect, has been termed the Gibraltar of America. Grouped on and below the rocky precipitous bluff, with its low irregular buildings and river craft at the base, it presents a quaint appearance. The city is divided into an upper and a lower town. Access to the former, perched high on the precipitous eminence, is obtained by several flights of narrow steps, an elevator, and a steep and winding street. The portion of the upper town near which lie the suburbs of St. John and St. Louis is surrounded by a massive wall, but several of the fortifications have been destroyed. Three gates have been removed, the two remaining being St. Louis and Kent gates. The summit of Cape Diamond is crowned by a citadel, covering 40 acres, at a height of 333 feet above the level of the river, dating in its present form from 1823 and garrisoned by Canadian militia. The upper town contains the principal residences, churches, buildings, public walks and gardens, and shops. One of its most interesting points is the Dufferin Terrace, a promenade, 1400 feet long and 200 feet above the river, opened in 1879 and affording a fine view. At the eastern extremity is a statue of Champlain, erected in 1898. This was constructed on the site of the residence of the early French governors, the Château St. Louis, destroyed by fire in 1834. In the Governor's garden, overlooking the St. Lawrence River, stands a monument to the memory of Wolfe and Montcalm, and on the St. Foye Road an iron pillar surmounted by a bronze statue commemorates the battle of St. Foye, fought on that site.

Quebec's chief attractions are the Parliament and departmental buildings; the courthouse, post office, customhouse, and city hall; the Masonic hall, the Roman Catholic cathedral, with specimens of several eminent painters; the Roman Catholic archbishop's palace, the Anglican cathedral, the Jewish synagogue, the church of Notre Dame des Victoires (1689, named in 1690 to commemorate the defeat of Sir William Phips); Hotel Frontenac, a hotel built in the style of a French château; the Grand Seminary of Quebec; Laval University, deriving its name from the first Bishop of Quebec and well equipped with a library of 125,000 volumes, a museum, a picture gallery, and scientific apparatus—the largest educational Roman Catholic institution in Canada; and the Ursuline Church and Convent, where Montcalm is buried. Quebec has also the Hôtel Dieu Convent and Hospital; the Marine Hospital, the Jeffrey Hale Hospital, the general hospital, and the asylum for the insane at Beauport. Besides the educational institutions already mentioned, there are the Laval Normal and Model School; the Convent of the Good Shepherd; a high school for Protestants; a public library located in the city hall; a Literary and Historical Society founded in 1824, which possesses valuable records and historical manuscripts; the Canadian Institute; Geographical Society; Advocates' Library; and Parliamentary Library.

The lower town is the seat of commerce, and much rock has been cut to construct its narrow irregular streets. Near it are the districts of St. Roch and St. Saùveur, containing many manufactories. The principal manufactures are leather, iron castings, boots, shoes, lumber, tobacco, biscuits, clothing, furs, musical instruments, cutlery, machinery, nails, India-rubber goods, rope, and steel. In 1910 the value of the manufactured output was $17,149,385. The chief exports are timber, wheat, and furniture. Quebec early achieved a reputation for shipbuilding, and the *Royal William*, credited the first vessel to cross the Atlantic by means of steam alone, was built here in 1831. The docks and wharves extend 3 miles from the mouth of the St. Charles, where the spacious Louise Basin is inclosed by the Louise Embankment, which forms a fine river-front promenade. In 1913, 539 vessels, with a tonnage of 2,477,842 tons, entered and cleared at Quebec. Of this 2,342,950 tons were British.

Quebec is supplied with water from Lake St. Charles and is lighted by electricity, the power for which is obtained from Montmorency Falls, 6 miles distant. Quebec sends three members to the Dominion House of Commons and three to the Provincial Legislature.

Interesting localities in the neighborhood include the Plains of Abraham, since 1908 a public park, named after a pilot of the St. Lawrence who owned this tract of land, and containing a monument to Wolfe in honor of the victory of 1759; Wolfe's cove, where the British troops landed for their assault on the city; Près de Ville, where General Montgomery fell Dec. 31, 1775; Montmorency Falls, where Montcalm resisted Wolfe, noted for its beautiful scenery and cataract; Beauport and its asylum; Lévis, with its three forts; Lorette (q.v.), with its falls, Indian church, and Indian settlement; the Chaudière Falls; Ste. Anne de Beaupré, a place of pilgrimage, whose church contains relics of Ste. Anne, supposed to effect marvelous cures; Château Bigot, an historical ruin near Charlesburg; Cap Rouge; and Isle d'Orléans, where General Wolfe established his camp prior to the siege of Quebec.

An Indian town named Stadacona occupied part of the present site of Quebec in 1535, when Jacques Cartier explored the St. Lawrence. An unsuccessful attempt at settlement was made by Sieur de Roberval in 1542–43. Its real founder was Champlain, who established a small trading post here in 1608 and gave it the name of Quebec. In 1629 Sir David Kirke captured the settlement, but it was restored to the French three years later. When the colony was made a royal government in 1663, Quebec became the capital. The English made two unsuccessful attempts to capture it, one in 1690 by Sir William Phips and the other in 1711 by an expedition under the command of Sir Hovenden Walker, and through the daring of General Wolfe in 1759 it finally fell into British possession, which has never been interrupted. A fruitless effort was made by the Americans to capture the city by assault on Dec. 31, 1775, when General Montgomery was killed. For several years (1851–55 and again 1859–65) Quebec was the capital of the Province of Canada under the Act of Union (1841–67), and the famous Confederation Debate took place in the old Parliament House in 1864. In 1908 a splendid tercentenary celebration of the founding of the city by Champlain was held. It was an event of international interest, the United States, Great Britain, and France sending representatives. Pop., 1881, 62,446; 1891, 63,090; 1911, 78,067, five-sixths being French and Roman Catholic.

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QUEBEC ACT. An Act of the English Parliament passed in 1774 providing a government for the Province of Canada, which had been acquired by the Treaty of Paris of 1763. The three features of the Act which have called forth the most extended discussion were (1) the extension of the boundaries of the province so as to include all the territory northwest of the Ohio River and east of the Mississippi, thus confining the Atlantic Colonies within the Alleghanies in spite of their claims to land to the west; (2) the substitution of the French civil law therein for English law; and (3) the withholding of representative English institutions, such as existed in the other English provinces. The Act excited great indignation among English-speaking peoples both at home and especially in the thirteen English Colonies. The reason assigned by the English for the extension of the boundaries was the necessity of annexing the Northwest Territory to some civil government in view of the almost anarchical conditions there prevailing; and having reached that conclusion, the government decided that there were good reasons why it should be annexed to Canada. With regard to the substitution of the French legal system for the English, the government claimed that on account of the predominance of the French element it was found impossible to put English law into practice except in commercial matters, and as the French customary law had for the most part continued undisturbed, the Act of Parliament in question merely legalized the existing status. Finally, the English justified the withholding of representative institutions on the ground of the religious difficulties involved. In view of the Roman Catholic majority it was deemed inexpedient to exclude Catholics from the assembly; on the other hand, it was thought unsafe to admit them, and as a consequence an appointed council took the place of a representative assembly. The Act was regarded by the English colonists as a blow aimed directly at them and was a factor in bringing on the Revolution.

For the American view of the spirit and purpose of the Act, consult George Bancroft, in *History of the United States* (New York, 1883-85); for the English view, G. E. Hart, *The Quebec Act, 1774* (Montreal, 1891); and an article in the *Annual Report of the American Historical Association, 1894* (Washington, 1895).

QUEBEC EXPEDITION. See WOLFE, JAMES.

QUEBRACHO, kā-brä′chō (Sp., break axe) (*Quebrachia lorentzii* or *Schinopsis lorentzii*). A South American tree of the family Anacardiaceæ, most abundant in Argentina, Uruguay, and Paraguay, extending into Brazil. The trees attain a height of 50 to 70 feet and a diameter of 2 to 4 feet. The wood is one of the hardest and heaviest known, having a specific gravity of 1.4. It is very durable and is used for railroad ties, ship and bridge timbers, wharves, etc. The heartwood yields 20 to 24 per cent tannin extract, which is used in the preparation of fine grades of leather. In addition to tannin extract quebracho contains a red, gambier-like coloring matter. Other kinds of quebracho occur in South America, white quebracho (*Aspidosperma quebracho blanco*) and red (*Aspidosperma quebracho colorado*). These species belong to the family Apocynaceæ. These trees also yield tannin extract, and the bark of the white quebracho contains aspidospermine, used medicinally in asthma, croup, etc.

QUECHUA, kā′chwä. A tribe of South American Indians. See QUICHUA.

QUEDAH, kā′dȧ, or **KEDA.** A tributary state of the Malay Peninsula, under British protection, on the west coast, north of Perak (Map: Siam, D 5). It formerly included the island of Penang and the territory of the Province of Wellesley. Area 3800 square miles. The principal sources of revenue are derived from exports of opium, rubber, tapioca, and coconuts. Pop., 1911, 245,986.

QUEDLINBURG, kvād′lĭn-bu̇rk. A city in the Province of Saxony, Prussia, on the Bode, 34 miles southwest of Magdeburg (Map: Germany, D 3). It preserves in part its ancient walls, timbered houses, and towers, and on a rocky height is an old castle, the seat of the famous abbey of Quedlinburg, founded early in the tenth century by Henry the Fowler, King of Germany, the first four abbesses of which were daughters of German emperors. The abbey of Quedlinburg, with its district, constituted a state of the German Empire down to 1803. It became Protestant in 1539. The abbey church, restored in 1862, with its mediæval relics, is of great interest, and there are other noteworthy ecclesiastical remains, an ancient town hall, and fine sculptural monuments, including statues of Klopstock and Karl Ritter, who were born here. Quedlinburg is the centre of the second largest seed-producing district in Germany, and manufactures machinery, aniline dyes, starch, cloth, and wire goods. There is a large annual cattle market. Quedlinburg was a member of the Hanseatic League until 1477. Pop., 1900, 23,378; 1910, 27,200.

QUEEN ANNE'S BOUNTY. The fund formed by the liberality of Queen Anne to augment the poorer livings of the Church of England. The basis of the fund was the annates, or the first year's whole profits of a spiritual preferment and the tithes of later years. This tax, which at one time went to the Pope, was annexed to the crown in 1535 during the reign of Henry VIII and received by his successors down to Queen Anne, who in 1704 formed it into a trust fund for the benefit of the poorer clergy of the Kingdom. During the year 1913 the administrators of the bounty augmented 170 livings and made benefactions to the extent of £23,732 and grants to the extent of £25,069. The capital fund amounted in 1913 to upward of £7,600,000.

QUEEN ANNE'S WAR. The name commonly given to that part of the struggle known as the War of the Spanish Succession which was fought in America. In America the war began in the fall of 1702 by an unsuccessful expedition from South Carolina against the Spaniards in St. Augustine. In the north the brunt of the war fell upon New England, for, in consideration of the fact that the Iroquois promised to remain neutral, the French decided it would be wisest not to attack New York. At first the New England Indians also promised Governor Dudley that they would remain neutral, but in a few weeks they broke their promise and, in conjunction with the French, ravaged the whole New England frontier. On Feb. 29, 1704, a party of French and Indians under Hertel de Rouville captured the town of Deerfield, Mass., burned it, killed 49 of the inhabitants, and took 100 or more prisoners. In August, 1708, the town of Haverhill, on the Merrimac, suffered a like fate. The British colonists in 1704 and again in 1707 attempted, but without success, to capture Port Royal in Acadia. In 1709 an expedition against Canada was planned, but the nonarrival of an expected English fleet caused the plan to miscarry. In September of the following year 6 English vessels, with 30 from New England and 4 New England regiments, sailed from Boston, and after a short siege Port Royal was compelled to capitulate. In honor of the Queen the place was renamed Annapolis. Encouraged by this victory, the English again planned the conquest of Canada. One expedition was to march from Albany and attack Montreal; another and the more important, the nucleus of which consisted of 15 English ships of war, 40 transports, and 7 battalions of Marlborough's veterans, was to operate against Quebec. The fleet, reinforced by many Colonial vessels, sailed from Boston on July 30, 1711, but on the night of August 22d 8 vessels and about 1000 men were lost upon the rocks of the Egg Islands in the St. Lawrence. Discouraged by this event, the incompetent commander, Sir Hovenden Walker, gave up the attempt, and the whole campaign ended in a miserable failure. The remainder of the struggle was marked merely by border raids, and no important operations were undertaken by either side. In 1713 the War of the Spanish Succession was brought to a close by the Peace of Utrecht, but hostilities with the Indians continued for some time. So far as the terms of the treaty concerned North America, the French gave up the territory around Hudson Bay, and surrendered all claim to sovereignty over Newfoundland, but retained the privilege of drying fish on the west coast. Acadia was also ceded to England, but the French were allowed to keep Cape Breton.

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QUEEN CHARLOTTE (shär'lŏt) **ISLANDS.** A group of islands off the coast of British Columbia, 130 miles northwest of Vancouver Island (Map: Canada, D 6). Area, 5100 square miles. They are mountainous, rising to a height of 5000 feet, except Graham Island, the largest and northernmost, which is chiefly a rolling plain. All of them are densely forested and the climate is very humid. Gold-bearing quartz and copper and iron ores exist and a fine grade of anthracite is mined. They are inhabited by the remnants of the Haida (q.v.) tribe (less than 700) and a few white settlers, chiefly engaged in halibut fishing in Hecate Strait.

QUEEN CHARLOTTE SOUND. The northern part of the channel separating Vancouver Island (q.v.) from the mainland.

QUEEN CITY, or QUEEN OF THE WEST. A popular name of Cincinnati, Ohio. Buffalo, N. Y., is called the Queen City of the Lakes; and Sydney, Australia, Queen City of the South.

QUEEN CONCH. A local name in the West Indies for one of the large helmet shells (*Cassis cameo*) extensively used for cameo cutting (see CAMEO), the under layer giving a deep claret-colored background to the white design carved in the superficial layers.

QUEEN ESTHER. See MONTOUR.

QUEENFISH, or WHITE CROAKER. A small sciænoid fish (*Seriphus politus*) of the southern part of California, which is common on sandy shores, is about a foot in length and is an excellent pan fish. It is bluish above and bright silvery below, with the fins bright yellow.

QUEEN OF SHEBA, THE. See KÖNIGIN VON SABA.

QUEEN OF THE ADRIATIC. A name given to Venice on account of its situation and its early importance in the commerce of the East.

QUEEN OF THE ANTILLES. Cuba, so called because of its natural beauties and advantages.

QUEEN'S BENCH. See KING'S BENCH.

QUEENS'BERRY, JOHN SHOLTO DOUGLAS, eighth MARQUIS OF (1844–1900). An English patron of sport. He succeeded his father in 1858, served in the army from 1859 to 1864, and was a representative peer for Scotland from 1872 to 1880. He became best known as a patron of sparring. He was one of the founders of the Amateur Athletic Club in 1860, and in 1867 took part in drawing up the rules bearing the name of Queensberry rules. See BOXING.

QUEENSBERRY, WILLIAM DOUGLAS, fourth DUKE OF (1724–1810). A British rake and sportsman, known as Old Q. He was notorious for his shameless excesses. As Earl of March he was Vice Admiral of Scotland from 1767 to 1776, and inherited the title of Duke, with a large fortune, in 1778. He is remembered chiefly through the poems written in his dishonor by Burns and Wordsworth. In Thackeray's *Virginians* he appears as the Earl of March.

QUEENSBERRY PLOT. A supposed Jacobite plot in Scotland in 1703, revealed, it was claimed, through the relations of the Duke of Queensberry with the notorious Lord Lovat (q.v.).

QUEENS' COLLEGE. A college at Cambridge, England. It was founded in 1448 by Queen Margaret of Anjou, consort of Henry VI, replacing a foundation called the College of St. Bernard, established two years earlier by her husband. The new foundation was known as Queens' College of St. Margaret and St. Bernard, but was refounded by Elizabeth Woodville, consort of Edward IV, under its present name. The site was given by Richard Andrew of Cambridge and the endowment gathered chiefly by the first master, Andrew Doket. Recently the college has had an enrollment of about 200 undergraduates. The buildings, which preserve their early character, are among the most interesting in the university. The library contains about 30,000 volumes. Queens' was the residence of Erasmus during his stay in Cambridge. Consult J. H. Gray, *Queens' College* (London, 1899).

QUEEN'S COLLEGE. A college at Oxford, England. It was founded in 1340–41 by Robert de Eglesfield, chaplain to Philippa, Queen of Edward III, for a provost and 12 scholars, in imitation of Christ and the Apostles. Poverty was enjoined; the college was very ecclesiastical in its tone, the fellows being required to be in holy orders, and, as a charity, 12 poor boys were supported out of its revenues. The positions in the college were virtually confined to the North Country, of which the founder was a native. Under the statutes of 1882 the college has a provost, from 14 to 16 fellows, about 25 scholars, and 2 Bible clerks. There are actually, however, 35 scholars and 20 exhibitioners, besides a number of honorary fellows and lecturers and college officials. The buildings date from the late seventeenth century, the hall by Sir Christopher Wren and the library, with about 60,000 volumes, being especially noteworthy. Among the distinguished members of the college have been John Wiclif (probably), Edward the Black Prince, Henry V, Addison, Wycherley, Jeremy Bentham, Mitford, and Jeffrey.

QUEEN'S COLLEGE, now **BELFAST UNIVERSITY.** An institution of higher education, situated at Belfast, Ireland. It was founded in 1845 and constituted part of Queen's University, Ireland, until the passage of the University Education Act in 1879; later it became a part of the Royal University of Ireland. In 1909 the college obtained an independent charter as Belfast University. See NATIONAL UNIVERSITY OF IRELAND; UNIVERSITIES.

QUEEN'S COLLEGE, CORK, founded 1845. See NATIONAL UNIVERSITY OF IRELAND.

QUEEN'S COLLEGE, GALWAY, founded 1845. See NATIONAL UNIVERSITY OF IRELAND.

QUEEN'S COUNSEL. See KING'S COUNSEL.

QUEEN'S COUNTY. A southeast inland county of Leinster, Ireland (Map: Ireland, D 6). Area, 664 square miles. The Barrow is the chief river. On the northwest border lie the Slieve Bloom Mountains, and the Dysart Hills occupy the southeast, the rest of the surface being flat or gently undulating. Dairy farming is the principal industry. Coarse linen and cotton cloths are manufactured in small quantities, and coal is mined. The capital is Maryborough. Pop., 1901, 57,225; 1911, 54,629.

QUEEN'S EVIDENCE. See KING'S EVIDENCE; STATE'S EVIDENCE.

QUEEN'S HOUSEHOLD, LADIES OF THE. See LADIES OF THE QUEEN'S HOUSEHOLD.

QUEENS'LAND. An original state of Australia, occupying the northeastern part of the continent. Its extreme length from north to south is 1200 miles, its extreme breadth 940 miles, and its area is estimated at 670,500 square miles, or nearly one-fifth of the area of the United States.

Queensland has a coast line of 3000 miles. The eastern coast is lined, at a distance away of 20 to 150 miles, by an immense coral reef called the Great Barrier Reef, which is about 1000 miles long and incloses a broad sheet of quiet water filled with numerous islands. It is indented and rich in harbor sites, including Port Curtis, one of the best harbors on the Pacific, and Moreton Bay, the outer harbor of Brisbane. The Great Dividing Range, which runs along the entire east coast of the continent, here recedes farther from the sea than in the two southern states. But it sends out a number of spurs and divides into parallel coast ranges, so that the whole eastern part of the state for 300 miles from the coast is rugged and mountainous, the ranges having an average elevation of 2000 to 3000 feet, with a maximum height of 5438 feet. The western half is an undulating plain traversed in its north-central part by a western spur of the Great Divide. There are four principal drainage systems: first, the rivers flowing eastward to the Pacific Ocean, which, though short, are navigable tidal streams for considerable distances; second, those flowing through the plain southward to the Darling; third, those flowing north to the Gulf of Carpentaria; and fourth, those flowing westward or southwestward and losing themselves in the great central plains of the continent. Queensland is better watered than any of the other states.

Queensland enjoys a comparatively equable climate. The mean annual temperature in the southeast part is 69° F., and even in the arid western plains the temperature seldom rises above 95° F. The rainfall is very unevenly distributed. On the east coast it ranges from 50 inches at Brisbane to 100 and even 150 inches farther north. It decreases very rapidly towards the interior, being generally less than 20 inches west of the mountains and falling to 6 inches in the extreme west. The rainfall throughout the state is very uncertain.

The great western plains have a rich black soil, but are generally treeless, though covered with grass and shrubs. The valleys along the coast are filled with thick deposits of alluvial soil of great fertility, and here we find a luxuriant tropical forest growth. Though the predominating species are Australian types, such as *Eucalyptus* and *Acacia*, the flora of Queensland differs from that of the other states in having a large admixture of Indian, Malayan, and Polynesian types, notably among the cycads and palms. Here grow the screw pines (*Pandanus*) and the Araucarias, while the coasts and tidal streams are lined with mangrove thickets. The fauna, on the other hand, is typically Australian.

The great western plains are Cretaceous, partly consisting of the series known as Desert sandstone. It incloses a large area of metamorphic rocks in the northwest, and disappears under the Tertiary strata fringing the shores of the Gulf of Carpentaria. The eastern mountain belt consists very largely of granites and igneous rocks, with extensive volcanic areas of more or less recent origin. The granite ranges are flanked by large areas of Paleozoic rocks, chiefly Devonian and Carboniferous. There are extensive coal beds in the state, both in the Carboniferous and in the Cretaceous strata of the west. Auriferous quartz veins are also scattered through the mountain region, and lodes of silver, copper, mercury, bismuth, antimony, tin, and cobalt are also found.

The principal metals obtained are gold, tin, silver, copper, and wolfram and bismuth. The total mineral output of the state in 1912 was valued at £4,175,355, and to the end of that year at £103,901,473. Of the latter figure gold amounted to £75,217,830 (from 1860 to 1912 inclusive); copper, £10,948,399; tin, £8,110,704; coal, £5,377,235. The gold output reached its maximum in 1900, being valued at £2,871,578; from a value of £2,839,801 in 1903 the yield of gold steadily declined to £1,128,868 in 1913. Value of other mineral products in 1913: copper, £1,660,178; tin, £343,669; coal, £403,767; silver-lead (including pure silver), £432,876; wolfram, £35,359; lead, £65,683. By quantity the principal mineral outputs were as follows in 1907 and 1912 respectively: gold, 465,882 and 347,946 fine ounces; copper, 12,756 and 23,120 tons; dressed tin ore (about 70 per cent tin), 5140 and 3230 tons; coal, 683,272 and 902,166 tons. Queensland shows promise of becoming a very important producer of coal. The coal-bearing strata are extensive and widely distributed; the Ipswich beds are estimated to occupy about 12,000 square miles and the Burrum fields a considerably larger area.

General agricultural interests are becoming increasingly important, though the vast region west of the mountains is too arid to admit of successful farming. Along the coast, however, the rainfall and the soil favor the growth of a very great variety of products both temperate and tropical. The area under crop (exclusive of permanent artificially sown grasses) increased from 3353 acres in 1860–61 to 224,993 acres in 1890–91, 457,397 acres in 1900–01, 667,113 acres in 1910–11, and 668,483 acres in 1912–13. The area under sown grasses, not included above, was 205,363 acres in 1912–13, as compared with 76,943 in 1907–08. Exclusive of green forage the crop having the largest acreage in 1912–13 was wheat, with 124,963 acres; the yield was 1,975,505 bushels. Maize was planted to 117,993 acres, yielding 2,524,371 bushels; hay, 87,643 acres, 119,867 tons; potatoes, 11,675 acres, 16,386 tons. The most important crop commercially is sugar cane. The area under sugar cane in 1912–13 was 141,652 acres. Of this amount the area of productive cane was 78,142 acres and unproductive cane 63,510 acres. The yield of cane in 1912–13 was 1,135,126 tons. The production of raw sugar amounted to 112,541 tons in 1912–13 and about 243,000 tons in 1913–14. The rich lands near the mouths of the numerous streams are well adapted to sugar culture. Formerly the plantation system prevailed, the labor being done chiefly by Kanaka immigrants. Kanaka labor was discouraged by the government and it was finally prohibited in connection with the sugar industry by law which became operative in July, 1913. From 1902–03 to 1912–13 the amount of sugar produced by colored labor declined from 68 per cent to 5 per cent of the total. A great variety of fruits are successfully grown. Bananas, pineapples, and oranges are extensively produced along the coast.

Queensland is still largely a pastoral country. Much of the region west of the mountains is adaptable to pastoral industries, though too dry for farming, and the sheep are mainly found in that part. The number of sheep increased from 6,935,967 in 1880 to 21,708,310 in 1892, but decreased to 10,339,185 in 1900. This decrease was attributed to drought. In many places the drought has been effectually guarded against by the boring of artesian wells, and occasionally by damming streams and other means. In 1911 sheep numbered 20,740,981 and in 1913 21,786,600. The latter number is 24.39 per cent of the total for the commonwealth. The estimated quantity of wool as in the grease shipped in 1911–12 was 142,382,269 pounds, and in 1912–13 136,878,270 pounds. The number of cattle increased from 3,162,752 in 1880 to 7,012,997 in 1894, after which time it decreased to 4,078,191 in 1900 and to 2,963,695 in 1905. From 1905 the number of cattle steadily increased to 5,073,201 in 1911 and 5,322,033 in 1913 (nearly half of the total for the commonwealth). The introduction of improved methods of caring for meat—freezing, preserving, etc.—makes possible larger shipments of meat products and increases the profit accruing in stock raising. Dairy farming is beginning to receive much attention and many coöperative creameries have been established in the southern part of the country. In 1900 there were 456,788 horses and 122,187 hogs in the state and, in 1913, 707,265 horses and 140,045 swine.

Queensland has a variety of industries, such as the manufacture of flour, sugar, butter and cheese, brewing and distilling, meat packing, tanning, and the sawing of lumber. In 1912 there were 1790 factories, employing 40,948 hands. The product was valued at £18,798,904.

The most valuable items of export are gold, wool, frozen meat, sugar, hides and skins, preserved and salted meats, and tallow. The largest imports are textiles and clothing, metal and metal goods.

In 1913 there were 4936 miles of railway in operation, of which 4524 miles were owned by the state and had been built and equipped at a cost of £29,758,652. The telephone and telegraph lines are controlled by the government.

The Governor is appointed by the British government. He has an executive council of 9 members. There is a parliament of two Houses—the Legislative Council and the Legislative Assembly. The members of the former are nominated by the crown for life, and in 1915 numbered 45. The 72 members of the Legislative Assembly are elected for three years. There is male and (since 1905) female suffrage, subject to 12 months' continuous residence but to no property qualification. Queensland sends 10 members to the commonwealth House of Representatives.

The ownership of public utilities on the part of the state has incurred heavy debt and a large annual revenue and expenditure. On June 30, 1914, the public debt stood at £55,023,506. In the fiscal year 1913 the revenue and expenditure amounted to £6,378,213 and £6,372,097 respectively. Of the revenue 12.65 per cent was derived from taxation, 54.11 from public works and services, 14.27 from land, and 12.16 from the commonwealth subsidy. Of the expenditure 28.91 per cent was for the public debt, 33.73 for the working expenses of railways and tramways, 7.65 for education, 5.44 for medical and charitable purposes, and 4.36 for police.

The population, exclusive of aboriginals, increased from 2257 in 1846 to 61,467 in 1864 and 213,525 in 1881. In 1891 the population was 393,718, the increase during the decade being 84.31 per cent; in 1901, 498,129, increase 26.52 per cent; in 1911, 605,813 (329,506 males, 276,307 females), increase 21.62 per cent. Of the total 74.09 per cent were born in Australia and 19.90 per cent in the United Kingdom. The total included 2508 half-caste aboriginals, 9123 full-blood and 940 half-caste Asiatics, and 2123 full-blood and 142 half-caste Polynesians. In addition to the total there were enumerated, in 1911, 8687 aboriginals living in a civilized or semicivilized condition. The total number of aboriginals is quite unknown, but has been estimated at 18,000 to 20,000. The population is confined chiefly to the coast region and is larger in the south. Estimated population, exclusive of aboriginals, June 30, 1914, 678,864. The capital is Brisbane.

In 1911 there were 212,702 adherents of the Church of England, 137,086 of the Church of Rome, 75,560 Presbyterians, 59,920 Methodists, 24,235 Lutherans. There is no state church. Education is compulsory between the ages of 6 and 12 years, but in some parts the law is not enforced. Primary education is free and nonsectarian. The amount of illiteracy is small. The expenditure of the state for education in 1913 was £487,500.

With the early history of Queensland are associated the Spaniard Torres, whose name is perpetuated in the strait separating that land from New Guinea, and the famous explorer Cook, who, in 1770, followed the coast from Moreton Bay to Torres Strait and made a chart of it. The explorations of Lieutenant Flinders, in 1799, opened the way for the settlement of the Moreton Bay district, but his work seems to have been neglected until Queensland was practically rediscovered by Oxley in 1823. In 1826 a penal settlement was established on Moreton Bay and the Brisbane River, but the convicts were soon removed and subsequent attempts to introduce a criminal population into the country failed before the strong opposition of the free inhabitants. The country was admirably adapted for grazing and drew a large immigration from the southern settlements, the population in May, 1859, when Queensland was set off as a separate colony, being about 25,000, mostly squatters. Brisbane and Ipswich were the only towns of importance. A severe financial panic in 1866 was followed by the discovery of gold in the years 1866–79, the mining interests henceforth playing a prominent part in the shaping of public policy. The importation of coolies for work on the sugar plantations led to many conflicts in Parliament. The Labor party exercised an important influence on affairs after 1890, though its power was not so fully developed as in the more southern colonies. In the winter of 1899 Queensland ratified the constitution for the new Australian commonwealth. See AUSTRALIA; AUSTRALIAN FEDERATION.

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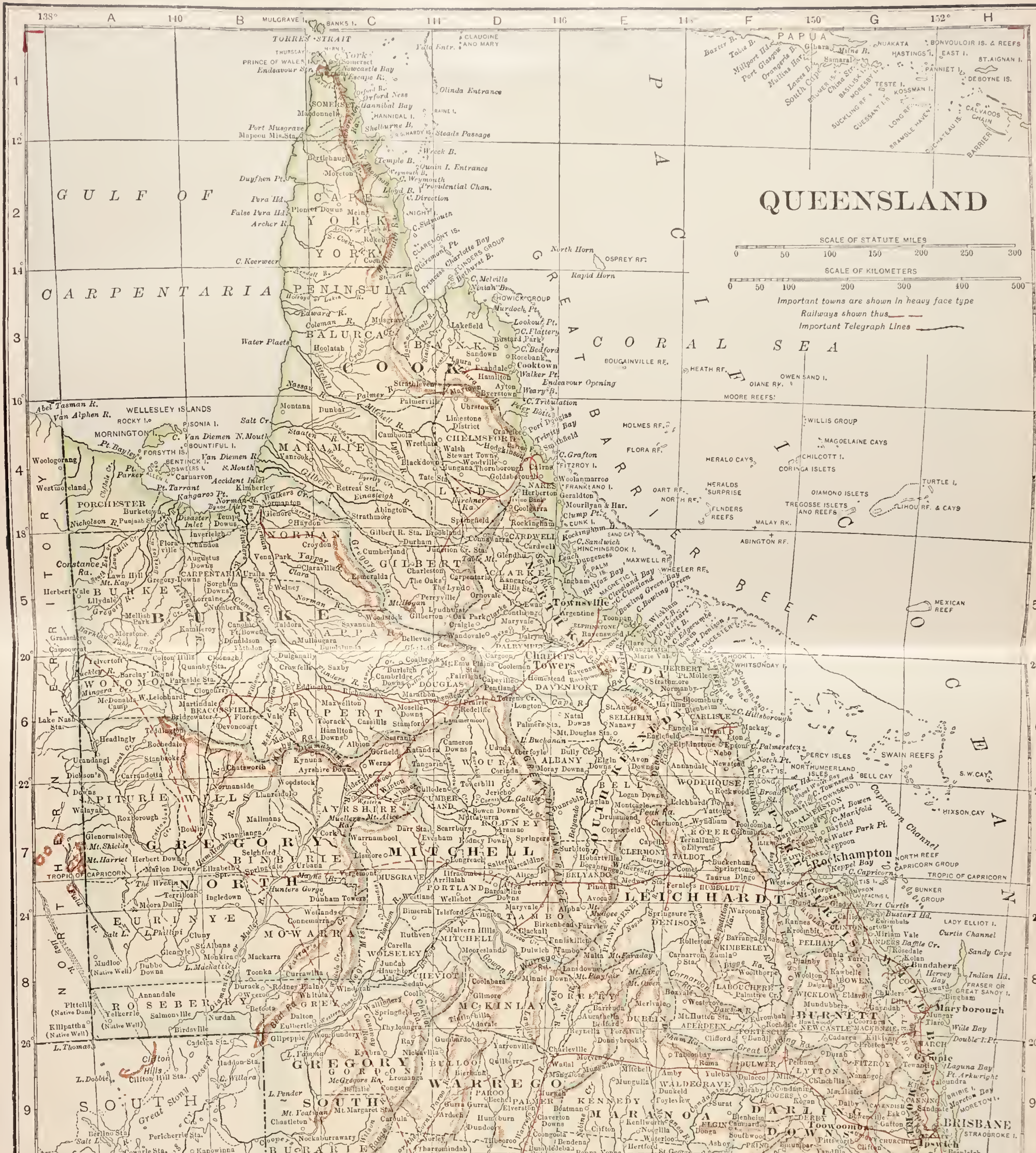
QUEENSLAND
SCALE OF STATUTE MILES
0 50 100 150 200 250 300
SCALE OF KILOMETERS
0 50 100 200 300 400 500
Important towns are shown in heavy face type
Railways shown thus
Important Telegraph Lines
Long. 146° East from 148° Greenw.
138° 140° 142° 144° 146° 148° 150° 152° 154°
A B C D E F G H
1 2 3 4 5 6 7 8 9 10
12° 14° 16° 18° 20° 22° 24° 26° 28°
TROPIC OF CAPRICORN
TORRES STRAIT
PAPUA
GULF OF CARPENTARIA
CORAL SEA
PACIFIC OCEAN
GREAT BARRIER REEF
CAPE YORK PENINSULA
NORTHERN TERRITORY
SOUTH AUSTRALIA
NEW SOUTH WALES
WELLESLEY ISLANDS
MORNINGTON I.
Capricorn Channel
Cape York
Cooktown
Cairns
Townsville
Charters Towers
Mackay
Rockhampton
Bundaberg
Maryborough
Gympie
BRISBANE
Ipswich
Toowoomba
COOK
BURKE
BURKE
BURKE
NORMAN
GILBERT
CARPENTARIA
WOOLGORANG
BURKE
GREGORY NORTH
GREGORY SOUTH
MITCHELL
LEICHHARDT
WARREGO
MARANOA
DARLING DOWNS
BURNETT
KENNEDY
AYRSHIRE
BALURCA
BANKS
CHELMSFORD
DOUGLAS
BEACONSFIELD
PITURIE
BINBURIE
MOWARRA
EURINYE
ROSEBERY
BULLOO
GORDON
BUCKARIE
KYRUNDA
WELLINGTON
CASSILLIS
BELMORE
KENNEDY
DARLING
BELL
ROPER
CLERMONT
DENISON
TAMBO
BELYANDO
SELLHEIM
LYTTON
FITZROY
WALDEGRAVE
CHEVIOT
McKINLAY
NANGO
Charleville
Cunnamulla
Roma
Longreach
Winton
Hughenden
Normanton
Burketown
Cloncurry
Camooweal
Boulia
Birdsville
Thargomindah
Stokes Ra.
Warwick
Stanthorpe
Gladstone
Clermont
Bowen
Emerald
Barcaldine
Aramac
Tambo
Blackall
Isisford
Goondiwindi
St. George
Dalby
L. Eyre
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QUEEN'S (or King's) **TOBACCO PIPE.** The popular nickname of a peculiarly shaped kiln or furnace in the northeast corner of the tobacco warehouses belonging to the London docks, in which contraband goods, such as tobacco, cigars, tea, which had been smuggled, and books were burned. Damaged and worthless goods are still burned, but seized and unclaimed goods are now sold generally at the periodical "customs sales" or distributed among public institutions.

QUEENS'TOWN, formerly Cove of Cork. A seaport town on the south side of Great Island in Cork Harbor, Ireland, 18 miles east-southeast of Cork (Map: Ireland, C 8). It is important as the port of call of the American mail steamers. The town is built amphitheatrically in parallel streets on the sides of a steep acclivity. A fine Roman Catholic cathedral, 100 feet high, surmounted by a tower 230 feet high, is a conspicuous building. The famous yacht club, the Royal Cork, is the oldest in the world. The Cove of Cork became important during the Napoleonic wars as the port of embarkation for troops going on foreign service and is now an admiral's station. In honor of Queen Victoria's visit in 1849 the name was changed to Queenstown. Pop., 1901, 7909; 1911, 7864.

QUEENSTOWN. A town and railway station, capital of the district of the same name, in Cape Colony, about 100 miles northwest of East London (Map: Cape of Good Hope, H 8). It is the centre of a productive wheat and sheep farming region situated in the valley of the Great Kei River. Pop., 1911, 9107, of whom 3964 were whites.

QUEIROZ, José María Eça de. See Eça de Queiroz.

QUELIMANE, kĕ'lē-mä'nȧ. A town of Portuguese East Africa. See Quilimane.

QUELLI'NUS, Artus (1609–68). A Flemish sculptor, born in Antwerp. He was the pupil of his father, the sculptor Erasmus Quellinus, and of Duquesnoy in Rome. His principal work was the decoration of the Town Hall in Amsterdam (now the Royal Palace), begun in 1648, for which he modeled two fine pediments celebrating the maritime power and colonial riches of Holland as well as numerous caryatides and bas-reliefs inside the building. There are works by him in the Museum and the churches of Antwerp, and he modeled the fine group of "Hercules and Fame," over the entrance of the Plantin Museum. Though baroque, and consequently somewhat exaggerated in style, his art is naturalistic, animated, and picturesque. His nephew and pupil, Artus (1625–1700), was also a sculptor and assisted his uncle in several of his undertakings. His best work is in St. James's Church, Antwerp. He excelled in modeling charming figures of cherubs and children.

QUELPART, kwĕl'pärt. The name by which the Korean island of Tamra is known to foreigners. It lies about 60 miles south of the mainland in lat. 33° 25′ N. and long. 126° 37′ E. (Map: Asia, O 5). It is nearly oval in form, measures 40 by 20 miles, and is covered almost entirely with mountains, which end steeply on the coast and culminate in Han-ra-san, or Mount Auckland, with a height of 6700 feet and visible far out at sea on account of its whiteness. On its summit are three extinct craters, within each of which is a lake of pure water, whence, according to local legend, issued the first three men of the world. Area, about 714 square miles. Pop., about 130,000. The chief industries are agriculture, fishing, straw plaiting, and the manufacture of the very fine split-bamboo hats which are peculiar to Korea. Quelpart is also noted for its fine breed of cattle. The island was first surveyed and mapped by the officers of the British ship *Samarang* in 1843. Consult: Sir E. Belcher, *Narrative of H. M. S. Samarang* (London, 1848); Hamel, "Narrative of Captivity in Korea," in W. E. Griffis, *Corea Without and Within* (New York, 1885).

QUENIULT, kwē'nĭ-ūlt' (properly *Kwinaiutl*). A small tribe of Salishan stock, formerly claiming the territory upon the river of the same name on the Pacific coast of Washington, where they still hold a reservation. They have greatly declined and number only 288. The Quaitso are a subtribe. See Salishan Stock.

QUENSTEDT, kvĕn'stĕt, Friedrich August (1809–89). A German mineralogist and geologist. He was born at Eisleben, studied at Berlin, and in 1837 became professor of geology and mineralogy at Tübingen. In geology Quenstedt made a special study of the sedimentary formations in Swabia, the basis of modern knowledge of the Jurassic system. His great contribution in mineralogy was in applying the analytic method to the study of crystalline systems. He published: *Methode der Kristallographie* (1840); *Handbuch der Petrefaktenkunde* (1851; 3d ed., 1882–85); *Handbuch der Mineralogie* (1854; 3d ed., 1877); *Grundriss der bestimmenden und rechnenden Kristallographie* (1873); *Die Ammoniten des schwäbischen Jura* (3 vols., 1885–88; incomplete).

QUENTAL, kȧɴ-täl', Anthero de (1842–91). A Portuguese poet, born at Ponta Delgada on the island of San Miguel. He studied law at the University of Coimbra and early began to write verse. As a poet he belongs to the Romanticists, stands second only to João de Deus-Ramos, and Almeida-Garrett (qq.v.), and is perhaps the most individual of the Young Portuguese school. He also wrote critical and philosophical articles, like his poetry, deeply pessimistic in tone. His works include a collection of sonnets (1863); *Beatriz* (1864);

Odes modernas (1865), reprinted with additions (1875); *Primaveras romanticas* (1872); *Sonetos* (1881); *Os sonetos completos* (1886); and the critical and philosophical *Bom senso e bom gosto* (1865); *A dignidade das lctras* (1865); *Considerações sobre a philosophia da historia literaria portugueza* (1872); *A poesia na actualidade* (1881). Consult: Björkman, *Anthero de Quental* (Upsala, 1894); Edgar Prestage, *Anthero de Quental, Sixty-four Sonnets* (London, 1894); *Anthero de Quental: In Memoriam* (Oporto, 1896), with studies of Quental by the leading Portuguese poets.

QUENTIN DE LA TOUR, MAURICE. See LA TOUR, M. Q. DE.

QUENTIN DURWARD, kwĕn′tĭn dûr′wẽrd. A novel by Sir Walter Scott (1823). The scene is France in the time of Louis XI.

QUÉRARD, kȧ′rär′, JOSEPH MARIE (1791–1865). A French bibliographer, born in Rennes. He worked in a bookseller's shop in his native town as a youth and went to Paris in 1822. The next two years he spent in the printing and bookselling business in Vienna and then returned to Paris to begin the publication of *La France littéraire ou Dictionnaire bibliographique, etc.* (1827–42; 2 vols. of supp. 1854–64). This work is an invaluable bibliography of eighteenth-century French authors. A continuation, *La littérature française contemporaine* (1842–57), was taken from his hands by the publishers and given to others, and Quérard died in poverty. He was the author of other less important bibliographical works.

QUER′CETA′NUS. See DUCHESNE, ANDRÉ.

QUERCIA, qwĕr′chȧ, JACOPO DELLA (c.1369-77–1438). The principal Sienese sculptor of the Early Renaissance. He was born at La Quercia, near Siena, and was probably the pupil of his father, a goldsmith. His earliest surviving works are a series of sculptures at Lucca, the principal of which is the tomb of the wife of Paolo Guinigi, tyrant of Lucca, in the cathedral. Never has the motive of death as sleep been more beautifully portrayed than here. One of his most important works is the Fonte Gaia, probably the most beautiful fountain in Italy, erected in 1409–19 in the public square of Siena, at a cost of 2280 gold florins. The fine series of statues and reliefs which adorned it were replaced in 1858 by good modern copies and are now in the museum of Siena. A bronze relief for the font of the baptistery of Siena, "Zacharias in the Temple," was not executed until 1430. His most important achievement was the decorations of the portal of San Petronio, Bologna, commissioned in 1425 and left incomplete at his death. The series includes five reliefs from Genesis and five from the "Youth of Christ," nine small figures of prophets, and a large Madonna with St. Petronius above the portal. The reliefs from Genesis are his most powerful creation and had a determinative influence on the art of Michelangelo.

Jacopo della Quercia is the most prominent representative of the transition from mediæval to Renaissance sculpture in Italy. He was the true successor of Giovanni Pisano, and the precursor of Michelangelo. His figures are massive and imposing; the action is powerful and dramatic, the composition is excellent, but the execution of detail is often defective. Consult Carl Cornelius, *Jacopo della Quercia* (Halle, 1896), and G. Waters, in *Italian Sculptors* (London, 1911).

QUERCITANNIC (kwẽr′sĭ-tăn′ĭk) **ACID.** See TANNIN.

QUERCITRON, kwẽr′sĭt-ron (from Lat. *quercus*, oak + *citrus*, citron). The name both of a dyestuff and of the species of oak of which it is the bark. This oak (*Quercus tinctoria*), also called dyer's oak, is a native of North America—one of the noblest forest trees of the United States, found in New England and as far south as Georgia, although there only at a considerable elevation. The wood is reddish, coarse-grained, and porous, but much esteemed for strength and durability, and is used in America for shipbuilding. The bark is used for tanning as well as for dyeing. It is the inner bark which is the quercitron of dyers. Its dyeing properties are due to two principles, quercitrin, $C_{36}H_{38}O_{20}$, and quercetin, $C_{24}H_{36}O_{11}$. The quercitrin may be extracted by means of alcohol; the extract is precipitated with lead acetate, the excess of lead is eliminated with sulphureted hydrogen, and the filtrate is allowed to evaporate, yielding crystals. On the addition of alum its solution assumes a beautiful yellow color. When boiled with dilute acids, quercitron breaks up into glucose and quercetin, a yellow crystalline substance, soluble in alkaline solutions, to which it communicates a golden-yellow color. It is brought into commerce under the name of *flavin*. The decomposition shows that quercitrin belongs to the glucosides, or compounds which, when broken up, yield sugar. Quercitron is principally used in calico printing.

QUER′CUS. The generic name for oak (q.v.).

QUERES. See KERESAN STOCK.

QUERÉTARO, kȧ-rā′tȧ-rō. An inland state of Mexico (Map: Mexico, J 7). Area, 3556 square miles. Querétaro belongs geographically to the plateau of Anahuac (q.v.), is traversed by mountain ranges in the north part, while in the south, plains and valleys prevail. It is watered by a number of small rivers, and the climate is temperate, with moderate frost and rainfall. The valleys are very fertile, and the chief agricultural products are cereals, sugar cane, cotton, and fruits. Some stock raising is carried on. The mineral wealth is considerable, and mining of silver, gold, copper, antimony, and cinnabar is carried on to some extent. The most famous opal mines in Mexico are located here. There are also some manufactures of cotton and woolen goods. Pop., 1895, 224,848; 1900, 232,389; 1910, 244,663. Capital, Querétaro.

QUERÉTARO. The capital of the State of Querétaro, Mexico, situated on an elevated plateau 110 miles northwest of the city of Mexico, on the National Railways of Mexico (Map: Mexico, J 7). It is a pleasant and well-built city and has several fine avenues leading to the beautiful parks which surround it. There are two large squares, on one of which stands the city hall and on the other the cathedral, one of the finest of the Republic. Other notable buildings are the government palace, built of basalt, the customhouse, several fine churches and hospitals, the elegant and historic Itúrbide Theatre, and the bull ring. There is a good water supply brought by an old Spanish aqueduct of 74 arches and 80 feet high. The city is an important industrial centre and contains some of the largest cotton mills in the country. Pop., 1910, 33,062.

Querétaro is one of the most historic cities of the Republic. It was here that the movement for independence began. It was the last place of refuge of Maximilian, and he and two of his generals were executed here in 1867.

QUESADA, kȧ-sä′dȧ, Gonzalo de (1868–1915). A Cuban diplomat and author, born in Havana. He was educated in the College of the City of New York and in New York and Columbia universities. In 1889 he attended the first Pan American Conference as secretary to Roque Saenz Peña (q.v.). He came under the influence of José Martí (q.v.) and aided the cause of Cuban independence by serving as secretary of the Cuban revolutionary party and the Cuban delegation in the United States. In 1898 he was chargé d'affaires of the Republic of Cuba in Washington. Quesada served as a delegate to the Cuba Constitutional Convention (1900) and as a member of the committee which drafted the constitution. Two years later he was elected to Congress, and later he was sent as Minister to the United States. In this last post he served till 1912, when he became Minister to Germany. He also acted as delegate of Cuba to the third and fourth Pan American conferences. His writings include: *Patriotismo* (1893); *Ygnacio Mora* (1894); *History of Free Cuba* (1898); *Cuba* (1905); *La patria alemana* (1913). He also edited the *Obras literarias* of José Martí (1900–11).

QUESADA, Gonzalo Ximenez de. See Ximenez de Quesada.

QUESNAY, kȧ′nȧ′, François (1694–1774). A French economist, born at Méré. He first distinguished himself as a surgeon and physician. His *Observations sur les effets de la saignée* (1730), in which he successfully opposed the theories of bleeding of the leading contemporary authority, led to his selection as secretary of the Academy of Surgery at Paris. Defective eyesight compelled him to abandon surgery for medicine. In 1749 he became physician to Madame de Pompadour, and he was appointed physician to the King in 1752. This position gave him leisure for philosophical and economic study, and in 1756 he published in the *Encyclopédie* articles on "Fermiers" and "Grains," in which he correctly analyzed the deficiencies of French agriculture and advocated the adoption of capitalistic methods in farming and the abolition of the vexatious taxes and restrictions which were impoverishing French agriculture. In these articles Quesnay advanced the doctrine that the sole source of national wealth is the surplus of agriculture, the *produit net*. In 1758 he published his *Tableau économique*, a work which disappeared in the early nineteenth century, but was found in 1890 and reproduced in facsimile at London in 1894. His chief influence upon economic thought was exercised through his disciples, who formed the sect afterward known as the Physiocrats (q.v.). Quesnay's works were collected and published in 1768 by Dupont de Nemours, under the title of *Physiocratie*. Consult: August Oncken, *Œuvres économiques et philosophiques de Quesnay* (Frankfort, 1888); H. Higgs, *The Physiocrats* (London, 1897); August Oncken, *Geschichte der Nationalökonomie* (Leipzig, 1902).

QUESNAY DE BEAUREPAIRE, de bō′r'pâr′, Jules (1838–). A French jurist and author, born at Saumur. He became especially conspicuous during the Boulanger and Dreyfus affairs and was president of the Court of Cassation before which Dreyfus was tried in 1889 and 1899. (See Boulanger, Georges Ernest; Dreyfus, Alfred.) In 1892, before the Court of Appeals, he represented the government in the Panama Canal affair (see Lesseps, Ferdinand de), but resigned rather than withdraw the accusation when political influence was brought to bear. From 1893 to 1901 he served as president of the Court of Cassation. He wrote: *Le Panama et la république* (1899); *Français et cosmopolites* (1901); *La conspiration de demain* (1906). He is also known, under the pseudonym Jules de Glouvet, as the author of several novels, among them *Le forestier* (1880); *Le marinier* (1881); *Le berger* (1882); *France* (1895). *Marie Fougère* appeared anonymously in 1886.

QUESNEL, kȧ′nĕl′, Joseph (1749–1809). A Canadian poet and dramatist. He was born at St. Malo, France. As a seaman he visited India, Madagascar, Africa, French Guiana, Brazil, and the Mississippi valley. In 1779, while in command of a ship, he was captured by an English frigate and taken to Halifax, whence, after his release, he went to Montreal. Later he settled at Boucherville. He wrote poems, musical pieces, and dramas, most of his work appearing in the *Répertoire national*. His chief publications were: *Colas et Colinette* (1788); *Lucas et Lucille* (1789); *L'Anglomanie; Les républicains français*. Consult Abbé Camille Roy, "French-Canadian Literature," in *Canada and its Provinces* (Toronto, 1913–14). See Canadian Literature.

QUESNEL, Pasquier (1634–1719). A French Jansenist theologian. He was born in Paris, July 14, 1634, studied at the Sorbonne, and entered the Congregation of the Oratory (q.v.) in 1657. At 28 he was director of the Paris house of his congregation. It was for the use of the young men under his charge that he commenced his series (afterwards celebrated) of *Réflexions morales* on the New Testament. Soon afterward he published an edition of the works of St. Leo (1675), much criticized for Gallicanism, and in 1676 placed by the Pope among prohibited works. He was forced to flee to Orléans in 1681 and thence to Brussels, where he attached himself to the party of Arnauld, the Jansenists. In this order he quickly became a leader. He continued his *Réflexions morales*, and in 1693–94 they were published in complete form, with the approval of several ecclesiastical dignitaries, but on examination they were found to contain all the most obnoxious doctrines of Jansenius. Quesnel, after three months in prison, escaped to Amsterdam, where he died, Dec. 21, 1719. His book was condemned by the celebrated bull *Unigenitus*, in 1713. See Jansenism.

QUETELET, kĕt′lȧ′, Lambert Adolphe Jacques (1796–1874). A Belgian statistician and astronomer, born at Ghent. He studied at the lyceum of his native city, where in 1814 he became professor of mathematics. In 1819 he was appointed to the same chair at the Brussels Athenæum, and in 1826 was chosen by William I to superintend the construction of the royal observatory in the capital, of which he became director in 1828. In 1836 he was made professor of astronomy and geodesy at the Brussels Military School. His numerous and valuable writings include: *Astronomie élémentaire* (1826; 4th ed., 1848); *Recherches statistiques sur le royaume des Pays-Bas* (1830); *Sur l'homme et le développement de ses*

facultés ou essai de physique sociale (1835); *Du système social et des lois qui le régissent* (1848); *Sur le climat de la Belgique* (2 vols., 1849–57); *Physique populaire de la chaleur* (1852); *Histoire des sciences mathématiques et physiques chez les Belges* (1865); *Météorologie de la Belgique, comparée à celle du globe* (1867); *Anthropométrie* (1872). He also published numerous papers on meteorology, astronomy, terrestrial magnetism, etc., in the *Mémoires* and *Bulletins* of the Belgian Royal Academy.

QUETLAVACA, kwĕt′lȧ-vä′kȧ. See CUITLAHUATZIN.

QUETTA, kwĕt′tȧ. The chief town of British Baluchistan, 104 miles north of Khelat. It is situated among high mountains in a position of great strategic importance, commanding the Khojok and Bolan passes (Map: India, A 2). There are extensive fortifications, with a strong garrison, an arsenal, the Indian Staff College, and a museum. The town is connected by rail with the railway system of India and is the centre of considerable trade. Quetta has grown rapidly since 1876, when a residency was established by Sir Robert Sandeman. Pop. (with cantonment), 1901, 24,584; 1911, 28,374.

QUETZAL, kĕt-säl′ (Nahuatl *quetzalli*, green feather). A celebrated trogon (*Pharomacrus mocinno*) of Central America, adopted as the national bird or symbol of Guatemala, because in ancient times it was regarded with veneration and its decorative feathers were reserved for chiefs of the native tribes. It inhabits the higher districts of Guatemala and southern Mexico and has the general habits of the trogons (q.v.). It clings to trees and scrambles about like a woodpecker, as its feet are ill adapted to walking; and its utterance is described as two sibilant, plaintive notes, gradually swelling into a loud, discordant cry. Its upper plumage is brilliant, iridescent green, golden on the crested head and bluish on the soft tail coverts, the two central ones of which are elongated to from 28 to 30 inches, or about four times the length of the true tail, the outer feathers of which are white barred with black. The wing coverts are also enlarged into plumes draped over the upper parts of the wing, and all the under parts below the breast are blood red. (See Plate of TROGON, HOOPOE, ETC.) This magnificent creature has the further value of having its colors fast, i.e., their brilliance does not fade after death, as is usual with such plumage; and this fact, together with the bird's beauty and grace, made it so desirable for millinery trimmings that the quetzal is now very rare. The female is less brilliant and lacks the long plumes covering the tail and wings of her mate.

QUETZALCOATL, kĕts′ȧl-kō-ät′′l. The Aztec god and culture hero who is the equivalent of the Mayan Kukulcan and the Quiché Gugumatz. The names in all instances mean plumed serpent. Quetzalcoatl was the particular deity of Cholula, one of the most ancient cities, still inhabited at the coming of the Spaniards. He was an older god whose vogue had largely passed away and he seems to have had a southern origin and to have come into Mexico during the so-called Toltec period. Quetzalcoatl was regarded as the special patron of works of art, such as fine textiles and jade ornaments. He was regent of the morning star and of the winds. His face was grotesque with reptilian characters. In the many myths connected with Quetzalcoatl he often appears a dupe to the wiles of Tezcatlipoca. Through this magician god he was forced to leave the fabulous Tula, promising to return again. The day Ce Acatl (one reed) was sacred to him, probably because one of the Venus revolutions began on this day. A late and popular version of the myth of Quetzalcoatl runs as follows:

Quetzalcoatl was an early king of mysterious and miraculous birth, the son of a virgin mother, who reigned at the ancient city of Tollan or Tula, about 40 miles north of the present city of Mexico. He was entirely unlike his people in appearance, being of fair skin, with a long white beard and flowing garments also of white and embroidered with the figure of the cross in red. He was mild and dignified in manner, took no wife, and founded convents of nuns devoted to the worship of the temple and vowed to chastity. He preached universal peace and brotherhood, and under his rule war became a thing unknown. He taught his subjects, known from their chief city as the Toltecs, the arts of agriculture, metal working, and architecture, and devised for them the calendar. At last by the evil wiles of Tezcatlipoca he was deprived of all his dignities at one blow. He made no resistance, telling his people that it was only the necessary accomplishment of a predestined fate and that he must leave them to go to the home of his father, Tlapallan, the Red Land in the southeast, but that he would return to them in some far future year of Ce Acatl. He started on his long journey, halting 20 years at Cholula, where he taught all his mysteries to the people, who thus became the priests of the Aztec religion and their city with its great temple pyramid the Mecca of the Aztec Empire. Arrived at the seashore, he sailed on a raft of twisting serpents out into the sunrise.

This version has been widely accepted as clouded history, disguised by poetic additions and lapse of time, and various writers have tried to identify the kingly teacher with St. Thomas, St. Brendan, or some other early Christian apostle; others have seen in it only another form of the universal myth of day and night, in which Quetzalcoatl is the god of light and sunshine, his rival the god of night and darkness. What is more likely is that Tezcatlipoca and his brother Huitzilopochtli were Aztec gods, and with the growth of Aztec power various explanations were made to explain why the old divinities of other tribes were replaced. The mildness of Quetzalcoatl harks back to the peaceful times before the Aztec idea of excessive human sacrifice to gods of war and conquest was developed.

By one of the most extraordinary coincidences in history, the year 1519, in which Cortés landed, was the Mexican year of Ce Acatl. It is said to have been ushered in by omens. Three blazing comets swept across the sky, the waters of the lake rose without apparent cause, and a strange light appeared in the east. Montezuma was troubled with presentiments for his Empire, and sent for the priests, who gave him only the boding prophecy that some great calamity was at hand. When the news came to him that the white strangers had landed from the east he said, "This is Quetzalcoatl returned to Tula," and on his first interview with Cortés the Indian King addressed him as their lost ruler. See also AZTEC; KUKULCAN; MEXICO; NAHUATLAN STOCK; TOLTEC.

QUEUE ROUGE, kẽ ro͞ozh (Fr., red tail). A name given in the French West Indies and also in Jamaica to a spider of the genus *Latrodectus*, which is very poisonous and occasionally causes the death of human beings. See Katipo; Malmignatte.

QUEUX, William Le. See Le Queux, William.

QUEVEDO Y VILLEGAS, kȧ-vā′ᴅō̇ ē̇ vē̇-lyā′-gȧs, Francisco Gómez de (1580–1645). A Spanish author. He was born in Madrid, studied at Alcalá de Henares, and became versed in theology, law, Hebrew, Greek, Arabic, and Latin, as well as in modern languages. Although a cripple and defective in eyesight, he figured in many duels, in one of which he mortally wounded a nobleman and had to flee the country in 1611. Soon, however, he was employed in connection with certain diplomatic missions, and when the Duke of Osuna was put at the head of the administration at Naples, Quevedo was made Minister of Finance under him. Osuna fell in 1620 and Quevedo shared in his misfortunes, being imprisoned for a good part of the next three years. Later he held a nominal appointment as secretary to King Philip IV. In 1639, suspected of having written some satiric verses attacking the extravagance of the King and his ministers, he was arrested and spirited off to the monastery of St. Mark in León, where he was kept for four years. At the fall of Olivares, the Prime Minister responsible for this last imprisonment, he was again set free, but his health was now undermined and he died at Villanueva de los Infantes, Sept. 8, 1645. A moralizing tone prevailed in his earlier prose works, but it is as a satirist that he best showed his powers, especially in the picaresque novel *Historia y vida del Buscón* (also called *El gran Tacaño*), published in 1626, and in his series of *Sueños* (Visions). The former work is excessively coarse, yet one of the most important of the Spanish romances of roguery. His prose writings are to be found in the *Biblioteca de autores españoles*, vols. xxiii and xlviii; for his verse, see vol. lxix. Consult Ernest Mérimée, *Essai sur la vie et les œuvres de Quevedo* (Paris, 1886), and Marcelino Menéndez y Pelayo, *Obras completas de Quevedo*, published by the Sociedad de Bibliófilos Andaluces (2 vols., Seville, 1897, 1903).

QUEZALTENANGO, kȧ-säl′tȧ-nän′gō̇. A city of Guatemala, capital of the department of the same name. It is situated on a plateau 7700 feet above sea level and 70 miles west of Guatemala city (Map: Central America, B 3). The town is built on the slopes of a steep ridge which divides it into two portions. It has a good water supply and a cool, healthful climate. It is the second city of the Republic in size and importance. It manufactures cotton and woolen fabrics and has a considerable trade in agricultural products. Pop. (est.), 30,000. Quezaltenango was an ancient Indian city and was settled by the Spaniards in 1524. In 1902 the town was destroyed by an earthquake, but was immediately rebuilt.

QUFT, kụft. See Koptos.

QUIANGAN, kē̇-äng-än′. See Ifugao.

QUI′A TI′MET (Lat., because he fears). A legal phrase denoting a variety of common-law remedies of an equitable nature to prevent anticipated injury. There were formerly six writs which could be sued out *quia timet* before actual injury had occurred, set forth by Lord Coke as follows: "First a man may have his writ or mesne before he be distrained. Second, a *warrantio chartæ*, before he is impleaded. Third, a *monstraverunt*, before any distress or vexation. Fourth, an *audita querela*, before any execution issued. Fifth, a *curia claudenta*, before any default of inclosure. Sixth, a *ne injuste vexes*, before any distress or molestation." These writs, which were formerly of much importance, are now obsolete; but the same end is attained by filing a bill *quia timet* in equity. Consult the authorities referred to under Equity; Pleading.

QUIBDO, kē̇b′dō̇. The capital of the Intendency of Chocó, Colombia, situated on the Atrato River, 30 miles from the Pacific coast and 90 miles southwest of Medellin (Map: Colombia, B 2). The town is built on piles and the houses are generally of poor construction. It is the residence of a United States consular agent. The surrounding district was formerly mined extensively for gold. Pop., 1912, 15,756.

QUIBERON, kē̇′brôɴ′. A small fishing town and sea-bathing resort in the Department of Morbihan, France, at the extremity of a long narrow peninsula forming the western horn of the Bay of Quiberon, 22 miles south-southeast of Lorient (Map: France, N., B 5). Pop., 1901, 3299; 1911, 3651. Near the neck of the peninsula are the famous megalithic monuments of Carnac. In 1746, during the War of the Austrian Succession, an English force attempted a landing here, but was severely repulsed. In 1759 Admiral Hawke completely defeated a French fleet under Admiral Conflans in Quiberon Bay. A body of French emigrant Royalists, under D'Hervilly and Puisaye, landed here from an English fleet in 1795 and endeavored to rouse the people of Brittany and La Vendée against the Convention, but were defeated and driven back to their ships by General Hoche, all the prisoners taken being shot by order of the Convention.

QUICHÉ, kē̇-chā′, or **KICHÉ.** An ancient civilized nation of Mayan stock (q.v.) occupying western Guatemala, with centres at Santa Cruz, Quiché, and Totonicapan, and speaking a Mayan language close to that of the Cakchiquel (q.v.). Their chronicles are said to date back to the beginning of the eighth century. Their national culture hero was Xbalanque, who was born of a virgin mother and whose deeds are recorded chiefly in their sacred book, the Popol Vuh (q.v.). Their culture was that common to most of the highland tribes of the Mayan stock. Their modern descendants still form a considerable part of the population of central and western Guatemala.

QUICHUA, kē̇-cho͞o′ȧ, **QQUICHUA, QUECHUA,** or **KECHUA.** One of the three important linguistic stocks of Peru, the others being the Aymara and the Yunca. From the Quichua stock came the famous tribe of the Inca, who in the last few centuries before the coming of Pizarro had spread their military rule from the present southern line of Colombia southward to the Mauri River in Chile and from the Pacific Ocean eastward across the Andes to the edge of the great tropical forest. Along the eastern edge of the Andes they extended their conquests far into Argentina. Inca traditions are far from uniform. It seems clear, however, that Cuzco was founded not earlier than the eleventh century. The founder of Inca power was Manco Ccapac, who is described as the son of Viracocha (q.v.), the principal deity. This Viracocha was a sun god, and the Inca chiefs were popularly known as Children of the Sun, while sun worship was the state religion. Inca power was on the wane when the Spaniards entered Peru. It had been at its height under the Inca Yupanqui about the year 1460. The Inca chiefs were supposed to marry their own sisters, but the twelfth in line married also a princess of Quito, and on his death civil war ensued between the rival sons. This war was going on when the Spaniards arrived, and it was cleverly turned to their advantage.

It must be remembered, however, that the Inca were only a small part of the Quichuan stock. The earlier activities of the tribes making up this linguistic division are uncertain. It is not improbable, however, that earlier cultures had been developed by some of them. According to some writers the early remains at Tiahuanaco are to be accredited to the Aymara stock, while in the lowlands along the coast were cities built by the Yunca.

QUICHUAN (kē′chwan) **STOCK.** A linguistic group of which the Quichua (q.v.) are the most noted representatives and including most of the ancient or existing tribes along the Pacific coast and in the Andes region of South America from about 2° N., on the southern border of Colombia, to about 32° S. in the neighborhood of Valparaiso, Chile. Within this general area, however, are the Yunca, Aymara, Puquina, and Atacameño, all of alien lineage, but confined to limited territorial districts. The boundaries of the linguistic stock nearly coincide with those of the ancient Peruvian Empire, but include also a few wild tribes, as the Malaba of northern Ecuador, never brought under subjection to the Inca rule or civilization. So far as any linguistic evidence can show, the line of migration appears to have been from north to south. The Quitu of Ecuador maintained an independent kingdom under 19 successive rulers, according to their own tradition, until finally subjugated by the Incas. In physical type all the tribes of this stock are of low stature, heavy build, and very strong. With the exception of the few wild border tribes, they were all sharers in the same general culture that prevailed throughout the ancient Empire, although in some cases, as with the Quitu, this appears to have been of indigenous growth before the consolidation of the Empire. The colonizing policy of the Incas tended to reduce the various cognate languages to one dialectic standard, the Quichua proper, which is still the prevailing language of Peru and Ecuador outside of the large cities. The present number of persons belonging to the Quichuan stock is probably not far from 3,000,000. Consult: J. J. von Tschudi, *Die Kechua-Sprache* (Vienna, 1853); id., *Organismus der Khetšua-Sprache* (Leipzig, 1884); E. W. Middendorf, *Die einheimischen Sprachen Perus* (6 vols., ib., 1890–92); Spilsbury, *Lenguas indígenas de Sudamérica: el Quichua* (Buenos Aires, 1898).

QUICK, JOHN (1748–1831). An English comic actor, born in Whitechapel, London. He went on the stage when he was 14. His most famous rôles were Tony Lumpkin in *She Stoops to Conquer* (1773) and Bob Acres in *The Rivals* (1775). He retired in 1798. Quick was short in stature, quaint and whimsical, and especially famous for his personation of old men.

QUICK, ROBERT HEBBERT (1831–91). An English educator, born in London. He graduated at Cambridge in 1854 and was ordained the following year. Afterward he was an assistant to Dr. Merriman at Cranley and assistant master at Harrow, and he was the first to lecture at Cambridge on the history of education (1881). His *Essays on Educational Reformers* (1868; 2d enlarged ed., 1890) is a valuable work. He also wrote on Fröbel, edited Locke's *Some Thoughts Concerning Education* (1880), and reprinted with notes Mulcaster's *Positions* (1888). Consult F. Storr, *Life and Memoirs of R. H. Quick* (London, 1899).

QUICKEN TREE. See MOUNTAIN ASH.

QUICK-FIRING GUNS. See ARTILLERY; MACHINE GUN; RAPID-FIRE GUN.

QUICKLIME. See CHUNAM; LIME.

QUICK MATCH. See PYROTECHNY.

QUICKSAND. A loose sand into which solid bodies readily sink. Quicksands are composed of very small rounded particles which under ordinary pressure do not pack together and when moistened behave like a fluid. They are especially common in glacial deposits and may be encountered almost anywhere within the region invaded by the continental ice sheet. Any heavy object placed upon quicksand is rapidly swallowed up, leaving no trace behind. In conducting mining and engineering operations it is sometimes necessary to freeze the quicksand by sinking pipes at intervals, which are then used for circulating brines or other liquids at low temperature. A more common method is to employ caissons, such as are used in excavating under water.

QUICKSILVER. See MERCURY.

QUI′DOR, JOHN (1800–81). An American figure and historical painter. He was born in Gloucester Co., N. J., and in 1826 removed to New York City, where he studied under Jarvis and Inman. Afterward he lived for a time on a farm near Quincy, Ill., but returned to New York City in 1851. He was not appreciated in his lifetime, was obliged to support himself by painting the panels of stage coaches and fire engines, and died in abject poverty. He was, however, a personal friend of Washington Irving, whose *Knickerbocker History of New York* gave him the subjects for the four paintings in the Brooklyn (N. Y.) Institute: "Dancing on the Battery" (c.1860), "Peter Stuyvesant's Wall Street Gate" (1864), "Voyage of the Good Oloff up the Hudson" (1866), and "The Voyage from Communipaw to Hell Gate" (1866). These show the mellow and harmonious color, poetic imagination, and naïve humor which have gained Quidor tardy recognition as one of the most gifted of early American painters. He also painted religious subjects, such as "Jesus Blessing the Sick." His work was usually on a large scale.

QUIDS. In American political history, the name applied to a faction of the Republican party, led by John Randolph (q.v.), which during the years 1805–11 opposed on many points the great majority of the party, led by Jefferson and Madison. The name Quid is said by some to have been taken from the phrase *tertium quid*, applied to Randolph and his supporters in allusion to their being unidentified with either of the then dominant parties; by others it is said to have been given to the faction in allusion to its having been cast out from the Republican party.

QUI′ETISM (Neo-Lat. *quietista*, from Lat. *quies*, quiet, rest). A type of mysticism (q.v.) which regards the most perfect communion with God as coming only when the soul is in a state of quiet in which it ceases to reason or to reflect either upon itself or upon God and, in a word, to exercise any of its faculties, its sole function being passively to accept the fellowship which God is ever ready to bestow. This type of effort for mystic experience is not confined to Christianity, but pervades all mysticism (q.v.), being especially visible in Hindu philosophy and Sufism (q.v.). In fact, the suppression of conscious will is the final stage in all preparation for the mystic trance; Quietism only lays more stress upon it. Essentially Quietistic elements are found in early Christian sects, such as the Euchites or Messalines of the fourth century and the Hesychasts among the Greek monks of Mount Athos in the sixth century. In the West the followers of Scotus Erigena in the ninth century taught a form of theosophy with Quietistic tendencies. Besides these there are the Beghards in the twelfth century, the followers of Master Eckhart in the thirteenth and fourteenth centuries, the Brethren of the Free Spirit, and later the Illuminati in Spain. In England the Quakers, in their doctrines of the inner light and of silent waiting before God, show Quietistic ideas.

The term is used as the particular name of a mystical movement in the Catholic church of the seventeenth century, mostly in Spain and France. It began with the Spaniard, Molinos (q.v.), but its most influential exponent was Madame Guyon (q.v.) in France. The great ecclesiastic Fénelon (q.v.) came under her influence and, while never going to the same extreme, defended Quietistic ideas. The Quietists held that God is always ready to speak directly to man, but that man can hear only when his soul is passive, when all desires and wishes are stilled and he waits in quiet for the voice of God. He is to lay aside reason and all passion, not to attempt to win for himself faith, hope, or love, not to desire heaven nor to fear hell, but to maintain an attitude of indifference to self and the world and allow God to play on the soul as an instrument only for His use. The Quietists were orthodox Catholics, but for them communion with God, once attained, had no need of the mediation of the Church. It was easy for the Church to find heretical elements in the movement, and it speedily fell under ecclesiastical condemnation. Bossuet (q.v.) employed his great talents against it, and as a distinct movement it disappeared; but wherever mysticism arises, Quietism is sure to appear in some form or other.

Consult the literature under Mysticism; also H. Heppe, *Geschichte der quietistischen Mystik* (Berlin, 1875); E. Murisier, *Les malades du sentiment religieux* (Paris, 1903); Joseph Hilgers, "Zur Bibliographie des Quietismus," in *Centralblatt für Bibliothekswesen*, vol. xxiv (Leipzig, 1907).

QUIGLEY, kwĭg′lĭ, James Edward (1854–1915). An American Roman Catholic archbishop. He was born at Oshawa, Canada, but was early taken by his parents to Lima, N. Y., and then to Rochester. Graduating from the Christian Brothers' Academy at Buffalo (1872), he studied at the Seminary of Our Lady of Angels (now Niagara University), at Innsbruck, and at the College of the Propaganda, Rome, where he graduated in 1879. Ordained a priest in the latter year, he was subsequently rector at Attica, N. Y. (1879–84), and in Buffalo of St. Joseph's Cathedral (1884–96) and St. Bridget's Church (1896–97). Father Quigley served as Bishop of Buffalo from 1897 to 1903 and as Archbishop of Chicago thereafter till his death.

QUILEUTE, kwĭl′ĕ-ōōt′, or **QUILLAYUTE,** kĭl′lȧ-yōōt′. A tribe of Chimakuan stock, formerly residing near Lapush on the coast of Washington. They were noted for their skill in whale and seal fishery. In 1910 they numbered 306. Consult A. B. Lewis, *Tribes of the Columbia Valley and the Coast of Washington and Oregon* (Lancaster, Pa., 1906).

QUILIMANE, kē′lė-mȧ′nȧ. A port in Portuguese East Africa, situated on the river Kwa-Rwa, about 6 miles inland (Map: Congo, Belgian, G 6). It lies in a low unhealthful region, but has a good harbor. Its commerce amounted in 1913 to over $1,250,000, one-third being exports. Pop. (est.), 3500, of whom some 100 are white.

QUILL (LG. *quiele*, *kiel*, MHG. *kīl*, Ger. *Kiel*, quill). One of the large feathers of the wings and tails of birds, remiges and rectrices. (See Feather.) Their hollow tubes, properly cleared of all oily or fatty matter and dried, are used as receptacles for gold dust and various purposes, but chiefly as writing pens, all of which were made from feathers until comparatively recently. Those plucked from geese were most generally used, but swan and turkey quills were not uncommon; and for very fine writing and for pen-and-ink drawing crow quills were preferred to all others. The conventional representation of a pen as a quill pen and such words as quill driver and penknife are relics of the custom.

QUILLARD, kē′yȧr′, Pierre (1864–1912). A French poet, critic, and scholar, born in Paris. He allied himself with the school of Symbolists (q.v.), but differed from many of his colleagues in his thorough knowledge and appreciation of the humanities. He had attended the Lycée Condorcet and later, in 1886, had been sent to Lisbon upon a paleographical mission. Returning to France the same year, he founded a review, *La Pléiade*, in which he published his first poems and a mystery in two tableaux, *La fille aux mains coupées*. Quillard went to Constantinople in 1893 and taught in the Armenian College. During this period he wrote *L'Errante* and *Les vaines images*, and after his return to Paris in 1896 he published all his work in *La lyre héroïque et dolente*, a title intended to be symbolic of his life. A year later he again went to the Orient, where he spent several years. He died in Paris.

QUILLBACK. See Skimback.

QUIL′LER-COUCH, -kōōch, Sir Arthur Thomas (1863–). An English author. He was born in Cornwall, Nov. 21, 1863, and was educated at Clifton and at Trinity College, Oxford, where he remained for two years as classical lecturer after taking his degree. Then he removed to London and devoted himself to literary work. He was one of the original staff of the *Speaker* and retained his connection with it until 1899. After 1891, however, he resided chiefly in his native county of Cornwall, whose scenery, traditions, and characters he faithfully depicted in his books. He was knighted in 1910 and in 1912 was made King Edward VII professor of English literature at Cambridge.

His writings include: *Dead Man's Rock* (1887); *Troy Town* (1888); *The Splendid Spur* (1889); *The Delectable Duchy* (1893); *Wandering Heath* (1895); *Ia* (1896); *The Ship of Stars* (1899); *Old Fires and Profitable Ghosts* (1900); *The Westcotes* (1902); *The Adventures of Harry Revel* (1903); *Fort Amity* (1904); *Poison Island* (1907); *Hocken and Hunken: A Tale of Troy* (1912); *News from the Duchy* (1913); *Nicky Nan, Reservist* (1915). In all of these a vivid and dramatic imagination, free from any touch of morbidity, is shown. This quality, together with his mastery of style, led to his being selected after Stevenson's death to complete the latter's novel *St. Ives.* Quiller-Couch, who is widely known by his pseudonym of "Q," edited two anthologies of English verse and published *Poems and Ballads* (1896) and *The Vigil of Venus and Other Poems* (1912), and, in the field of essays, *Adventures in Criticism* (1896), *From a Cornish Window* (1906), and *On the Art of Writing* (1914). Consult William Archer, *Poets of the Younger Generation* (New York, 1902).

QUIL'LINAN, Edward (1791–1851). A British poet, born at Oporto in Portugal. Educated at a Roman Catholic school in England, he returned to Portugal and took a position, against his inclination, in his father's counting-house. On the French invasion (1807) the family fled to England. Edward entered the army and served for some time in the Peninsular War. Retiring from the army (1821), he settled in the Lake District near Wordsworth, whose daughter Dorothy became his second wife. He died at Ambleside. Quillinan wrote a good deal of mediocre verse and a military novel, *The Conspirators* (1841). His last years were given to a translation of the *Lusiad* of Camões, which was never completed. A volume of his selected *Poems* appeared in 1853. His wife, Dorothy Quillinan (1804–47), was author of a charming book of travel entitled *A Journal of a Few Months' Residence in Portugal and Glimpses of the South of Spain* (1847).

QUILLOTA, kė̄l-yō'tȧ. A town in the Province of Valparaiso, Chile, situated in a pleasant plain on the Aconcagua River, 20 miles northeast of Valparaiso, and on the railroad between that city and Santiago (Map: Chile, E 4). It is the centre of a copper-mining district. Pop., 1907, 11,449.

QUILOA, kė̄-lō'ȧ. A seaport town of German East Africa. See Kilwa Kivinje.

QUILP. A repulsive and malicious dwarf in Dickens's *Old Curiosity Shop.*

QUIMBY, kwĭm'bĭ, Phineas Parkhurst (1802–66). An American mental healer. He was born in Lebanon, N. H., and after various attempts in business he became a watch and clock maker. In this occupation he had been engaged for some years when in 1840 mesmerism attracted his attention. Although not indebted to it for his first investigations in mental healing, he used mesmerism as a help in the treatment of his patients, discarding it after claiming the discovery that disease is primarily an erroneous belief, to be cured by truthful suggestion. For many years he practiced mental healing with great success in different towns in Maine. About 1858 he opened an office in Portland. In October, 1862, Mary Baker Eddy (q.v.), then Mrs. Patterson, became his patient, and many years afterward there was a warm controversy as to whether Mrs. Eddy was not considerably indebted to him for the foundations of Christian Science. Mrs. Eddy denied any obligation. Before his death, at Belfast, Me., Quimby had elaborated his method of cure into "a true science of life and happiness." It is from him and his adherents that the cult of metaphysical healing called Mental Science (q.v.) is chiefly derived. Consult A. G. Dresser, *The Philosophy of P. P. Quimby* (Boston, 1895), and J. A. Dresser, *The True History of Mental Science* (ib., 1899).

QUIMPANO. See Philippine Islands.

QUIMPER, kăɴ'pâr' (Bret. *kemper*, confluence). The capital of the Department of Finistère, France, picturesquely situated at the confluence of the Steir and the Odet, about 68 miles south-southeast of Brest (Map: France, N., A 4). The cathedral of St. Corentin, a stately and richly ornamented Gothic edifice commenced in 1424, is the principal building. The eleventh-century church of Locmaria and the sixteenth-century church of St. Mathieu are interesting. The educational institutions include a lyceum, public library, and museum. Potteries, tanyards, breweries, and paper factories are the chief industrial establishments, and a coasting trade and sardine fishing are actively carried on. Quimper was the ancient capital of Cornouailles. Pop., 1901, 19,441; 1911, 21,051.

QUIMPERLÉ, kăɴ'pâr'lȧ'. The capital of an arrondissement in the Department of Finistère, France, on the Laïta, 12 miles northwest of Lorient (Map: France, N., B 5). Its chief buildings are the fourteenth-century church of St. Michel and the church of Ste. Croix, modeled after the Holy Sepulchre at Jerusalem. It has fisheries and carries on a coasting trade. Pop., 1901, 9036; 1911, 8705.

QUIN, James (1693–1766). A celebrated actor of Irish descent, born in London. He made his first appearance on the stage about 1714 at Dublin as Abel in *The Committee.* In 1716 he appeared in London as Bajazet in *Tamerlane.* Next year he went to Lincoln's Inn Fields, where he remained as a principal actor for 14 years. In 1734–35 he returned to Drury Lane, and until the appearance of Garrick in 1741 he was, by universal consent, the first actor in England. In 1751 he withdrew from the stage as a regular actor and made his home at Bath, where he died. Consult an unreliable *Life of Mr. James Quin, Comedian, with the History of the Stage from his Commencing Actor to his Retreat to Bath, etc.* (London, 1766; reprinted, ib., 1887); also: Colley Cibber, *Apology* (ib., 1740; ed. by Bellchambers, ib., 1822; also by Lowe, ib., 1889); Thomas Davies, *Life of Garrick* (ib., 1780; new ed., 2 vols., ib., 1807); John Doran, *Annals of the English Stage* (3 vols., ib., 1887).

QUINAAN. See Philippine Islands.

QUINAIELT. See Queniult.

QUINAULT, kė̄'nō̇', Philippe (1635–88). A French librettist and dramatist, born in Paris. He wrote lyric tragedy, for which the music was furnished by Lulli. Quinault was precocious, his first play having been produced when he was 18, and his earliest comedies are among his best: *Les rivales; L'Amant indiscret* (1654); *Le fantôme amoureux* (1659); *La mère coquette* (1665). His tragedies and tragi-comedies are slight. *Psyché*, the first of his lyric dramas (1671), was written in collaboration with Molière and Corneille. After this he devoted himself almost entirely to libretto work, remarkable for its ingenious artistry. In this kind his masterpieces are *Amadis* (1684), *Roland* (1685), and, best of all, *Armide* (1686). In 1687 Lulli died and Quinault began to write on the *Destruction of Heresy*, a poem which he did not live to complete. His works were edited in five volumes (1739, 1778); *Selected Works* (1824–42). Consult F. V. Fournel, *Les contemporains de Molière* (3 vols., Paris, 1863–76), and Erich Richter, *Philippe Quinault: sein Leben, seine Tragödien, seine Bedeutung für das Theater frankreichs und das Auslandes* (Leipzig, 1910).

QUINCE (variant of obsolete Eng. *quine*, from OF. *coin*, Fr. *coign*, quince, from Lat. *cydonium*, from Gk. *κυδώνιον*, *kydōnion*, quince, Cydonian, sc. *μῆλον*, *mēlon*, apple, from Κυδωνία, *Kydōnia*, Κυδωνίς, *Kydōnis*, Cydonia, an ancient city of Crete), *Pyrus cydonia.* A shrub or small crooked tree of the family Rosaceæ, closely related to the apple and pear, which it resembles in leaf, flower, and fruit, but with solitary terminal flowers on the present season's growth. Since the quince cannot be eaten raw, it has a restricted use, and although cultivated for more than 2000 years, it has developed few varieties. It is employed chiefly as a preserve, for jellies, and for flavorings in other fruit preparations. Certain varieties, notably the Angiers, are extensively employed as a stock for dwarfing pears. The quince is propagated by cuttings or mound layers. It thrives best on strong, retentive, well-drained soil. The trees are set 15 feet apart each way, given clean culture, and headed in sufficiently to hold the leading branches in check and to thin the fruits, which, since they ripen late, should not be gathered until after early frosts. They must be as carefully handled as pears. The quince is especially subject to fire blight and is attacked by other diseases of the apple (q.v.). The most extensive and profitable orchards in the United States are located in western New York. Consult W. W. Meech, *Quince Culture* (New York, 1896).

QUINCE.

QUINCE CURCULIO. See QUINCE INSECTS.

QUINCE INSECTS. The quince is attacked by many of the insects which have the general habit of feeding upon rosaceous plants, and especially very many of those forms which are found upon pears and apples, although it is rather less susceptible than either of these fruits. The quince scale (*Aspidiotus cydoniæ*) is found upon the quince tree in the southern United States. It is grayish in color, somewhat resembling the San José scale, but is more transparent and is very convex in form. The quince curculio (*Conotrachelus cratægi*) is a species closely related to the plum curculio, although differing in general appearance. It is a broad-shouldered snout beetle, larger than the plum curculio and having a longer snout. It is ash gray in color, mottled with ochre and whitish, and with a dusky subtriangular spot at the base of the thorax above. It is indigenous to the United States, and appears in the month of June, puncturing the young fruit and making a cylindrical hole in which the egg is placed. The egg hatches in a few days and the larva burrows in the fruit near the surface. It becomes full-grown in a month and falls to the ground, burying itself to a depth of from 2 to 3 inches, remaining there through the winter and transforming to pupa early in May. The pupa stage is short and the adult beetle emerges almost as soon as the fruit is set. The adult also feeds upon the quince, burying itself completely in the pulp of the fruit. It occasionally attacks the pear.

Among the caterpillars which feed upon quinces the bagworm (q.v.) is perhaps the most destructive. Consult Slingerland and Crosby, *Manual of Fruit Insects* (New York, 1914).

QUIN′CKE, GEORG HERMANN (1834–). A German physicist, born at Frankfort-on-the-Oder. He received his Ph.D. in 1858 at Berlin, having previously studied also at Königsberg and Heidelberg. He became privatdocent at Berlin in 1859, was appointed professor in the University of Würzburg in 1872, and in 1875 was called to be professor of physics at Heidelberg, where he remained until his retirement in 1907. His doctor's dissertation was on the subject of the capillary constant of mercury, and his investigations of all capillary phenomena are classical. He also did important work in the experimental study of the reflection of light, especially from metallic surfaces, and carried on prolonged researches on the subject of the influence of electric forces upon the constants of different forms of matter, modifying the dissociation hypothesis of Clausius (q.v.). Quincke received a D.C.L. from Oxford and an LL.D. from Cambridge and from Glasgow and was elected an honorary fellow of the Royal Society of London. His contributions to physics and other fields of science are numerous. He published also a *Geschichte des physicalischen Instituts der Universität Heidelberg* (1885).

QUINCY, kwĭn′sĭ. A city and the county seat of Gadsden Co., Fla., 24 miles northwest of Tallahassee, on the Seaboard Air Line and the Georgia, Florida, and Alabama railroads (Map: Florida, B 1). It is in a rich agricultural and tobacco region, which contains also the most extensive deposits of fuller's earth found in the United States. A considerable trade is carried on in the product of these mines and in wrapper tobacco. Pop., 1900, 847; 1910, 3204.

QUINCY, kwĭn′zĭ. A manufacturing city and the county seat of Adams Co., Ill., 263 miles southwest of Chicago, on the Mississippi River, here spanned by a fine railway and wagon bridge, and on the Chicago, Burlington, and Quincy, the Wabash, and the Quincy, Omaha, and Kansas City railroads (Map: Illinois, B 6). It has a large and deep harbor, is regularly laid out on limestone bluffs, 160 feet above high water, and has 50 miles of paved streets and 15 miles of boulevards. There are many fine parks, including South, Riverside, Washington, Madison, Indian Mounds, and Primrose. Among the educational institutions are St. Francis Solanus College (Roman Catholic), opened in 1860, Chaddock Boys' School (Methodist Episcopal), St. Mary's Institute (Roman Catholic), Gem City Business College, 12 public schools, and a free public library containing 40,000 volumes. Other noteworthy features are the Illinois State Soldiers and Sailors Home, occupying 250 acres and consisting of 60 buildings, Blessing and St. Mary's hospitals, the Quincy Historical Society, Cheerful Home Settlement, Woodland Orphans Home, courthouse, Federal building, Masonic Temple, State Armory, city hall and various business structures.

Quincy is admirably equipped with transportation facilities for an industrial and commercial centre. It carries on an active trade, and its industries, according to a local estimate made in 1915, represented an invested capital of $18,000,000, with an annual production valued at $23,000,000. Important manufactures are stoves, engine governors, show cases, store fixtures, incubators, elevators, pumps, agricultural implements, vehicles, tobacco, air compressors, dyes, optical goods, shoes, cereals, machinery, stationery, etc.

The government is vested in a mayor, elected biennially, and a unicameral council, and in administrative officials who are, for the most part, appointed. Quincy spent in 1913 for maintenance and operation $369,000, the chief items of expenditure being: $34,000 for the police department, $59,000 for the fire department, and $152,000 for education. The water works, which have a modern filtration system, are owned by the city. Pop., 1900, 36,252; 1910, 36,587; 1914 (U. S. est.), 36,730. Quincy was settled in 1821 and founded on May 1, 1825, by John Wood, subsequently Governor of Illinois. It was incorporated in 1834 and five years later received a city charter. Consult: Tillson, *History of Quincy* (Quincy, 1869); Henry Asbury, *Reminiscences of Quincy, Illinois* (ib., 1882); Collins and Perry, *Past and Present of Quincy and Adams County* (ib., 1905).

QUINCY, kwĭn′zĭ. A city, including within the municipal limits several villages, in Norfolk Co., Mass., adjoining Boston on the south, on Quincy Bay, between the Neponset River on the north and Fore River on the south, and on the New York, New Haven, and Hartford Railroad (Map: Massachusetts, E 4). Its area is more than 26 square miles, 2530 acres of which are in public parks, the most prominent being Merrymount and Faxon. Quincy has the Thomas Crane Public Library, Adams Academy, the Quincy Mansion Girls' School, the Woodward Girls' School (public), and a city hospital. There are many points of historic interest in this vicinity, and here was constructed in 1826–27 the first railroad in New England, built for carrying granite for building Bunker Hill Monument and operated by horses. Quincy is primarily a residential suburb of Boston, but has extensive granite quarrying and cutting interests, a large shipbuilding plant, scales and electrical goods factories, and rivet and stud works. The government, under a revised charter of 1900, is vested in a mayor, annually elected, and a unicameral council. The mayor controls appointments of the heads of all departments excepting that of the school committee. The school committee is chosen by popular vote. Pop., 1900, 23,899; 1910, 32,642; 1914 (U. S. est.), 36,366.

Settled in 1625 as Mount Wollaston, Quincy is one of the oldest permanent settlements in Massachusetts. About 1629 Thomas Morton (q.v.) gained control and established his famous "New English Canaan," Merrymount. Becoming obnoxious to the Puritans at Boston because of his encouragement of Maypoles and other reprehensible "idolls," and because of "his great licentiousness of life in all profaneness," he was captured by Miles Standish and shipped off to England. Until 1792, when it was incorporated under its present name in honor of John Quincy, the settlement formed part of Braintree. It was chartered as a city in 1888. It was the birthplace of John Hancock, John Adams, and John Quincy Adams, the last two being buried here under the old Stone Temple. Consult: W. S. Pattee, *History of Old Braintree and Quincy* (Quincy, 1878); D. H. Hurd (ed.), *History of Norfolk County* (Philadelphia, 1884); C. F. Adams, *The Centennial Milestone: An Address* (Cambridge, Mass., 1892); id., *Three Episodes of Massachusetts History* (Boston, 1892); D. M. Wilson, *Where American Independence Began* (ib., 1902).

QUINCY, Edmund (1808–77). An American author and reformer, prominent as an Abolitionist during the antislavery struggle. He was a son of Josiah Quincy (1772–1864), and was born in Boston and graduated at Harvard in 1827. After the killing of Elijah P. Lovejoy (q.v.) by a mob at Alton, Ill., in 1837, he became an ardent Abolitionist of the radical or Garrisonian school, frequently spoke in public, was secretary, for some years, of the American Antislavery Society, coöperated with Garrison and Mrs. Chapman in issuing the *Non-Resistant*, a short-lived antislavery paper, and wrote many articles and pamphlets in favor of abolitionism. He wrote a novel, *Wensley: A Story without a Moral* (1854); an excellent *Life of Josiah Quincy* (1867); and *The Haunted Adjutant and Other Stories* (published posthumously, 1885); and edited *Speeches Delivered in the Congress of the United States* (1874).

QUINCY, Josiah (1744–75). An American patriot, born in Boston, Mass., Feb. 23, 1744. He graduated at Harvard in 1763, read law with Oxenbridge Thacher, and was admitted to the bar, rising to a high rank in his profession. He denounced the Stamp Act through the press and at public meetings in Boston and took strong ground against the exactions of Parliament. In 1770 he and John Adams conducted, in the face of an excited popular feeling, the defense of British soldiers implicated in the Boston massacre, and in the same year he prepared the address of the merchants of Boston on the nonimportation agreement and also wrote a number of essays for the Boston *Gazette*. Both in 1770 and in 1772 he drafted the instructions of the town of Boston to its representatives in the Legislature, and throughout 1771 and 1772 he was a frequent contributor to the *Gazette*, chiefly under the signatures Mentor and March-mont Needham. During all these years he maintained a large practice, though finally his health failed, and in 1773 he went to Charleston, S. C., taking advantage of his journey to enter into relations with the Patriot leaders in the Southern and Middle States and to arrange for a system of communication between them and the leaders of the same party in Massachusetts. In May, 1774, appeared his *Observations on the Boston Port Bill*, which clearly indicated war as the only means of settling the disputes between Great Britain and the colonists and intimated that independence must be the result. In September of the same year he went to England as the agent of the Patriot party and there lived on friendly terms with Barré, the Earl of Shelburne, Priestley, and other friends of the Colonies, and had interviews with Lords Dartmouth and North. He sailed for home in the spring of 1775, but died on the voyage, April 26. His *Life* was written by his son Josiah (2d ed., Boston, 1874), and his *Reports of the Supreme Court of Massachusetts Bay, 1761–72*, edited by his great-grandson, Samuel M. Quincy, appeared in 1865.

QUINCY, Josiah (1772–1864). An American lawyer, orator, and man of letters, son of Josiah Quincy (1744–75). He was born in Boston, graduated at Harvard in 1790, studied law, and took an active interest in politics as a leading member of the extreme wing of the Federalist party in New England. He was a member of the State Senate in 1804, and in 1805 entered Congress, where he became distinguished as a ready, earnest, and fervent orator, in opposition to the policy of Jefferson and Madison. He was one of the earliest to denounce slavery in Congress, and declared in a notable speech of June 4, 1811, that the purchase of Louisiana was a sufficient cause for the dissolution of the Union. He opposed the war with England. Disgusted with the triumph of the Republican party and its advocacy of the War of 1812, he declined a reëlection to Congress and devoted his attention largely to scientific agriculture. He became, however, Speaker of the Massachusetts House of Representatives in 1821, a member of the Senate in the following year, and also judge of the municipal court of Boston. In 1823 he was elected mayor of Boston, his administration being signalized by many notable municipal reforms. In 1829 he accepted the presidency of Harvard College, which he held until 1845. Among his published works are a memoir of his father (1825); *History of Harvard University* (2 vols., 1840); *The Municipal History of the Town and City of Boston* (1852); a *Memoir of the Life of John Quincy Adams* (1858). Consult Edmund Quincy, *Life of Josiah Quincy* (Boston, 1867), and Mellen Chamberlain, "Josiah Quincy, the Great Mayor," in Massachusetts Historical Society, *Publications* (ib., 1889).

His son of the same name (1802–62) was President of the Massachusetts Senate in 1842 and mayor of Boston in 1845–49, and his great-grandson, also named Josiah (1859–), was Assistant Secretary of State of the United States in 1893 and mayor of Boston in 1895–99.

QUINCY, kăN′sē̇′, Quatremère de. See Quatremère de Quincy.

QUINET, kē̇′nȧ′, Edgar (1803–75). A French poet, publicist, and historian of literature. He was born at Bourg, Feb. 17, 1803, and died at Versailles, March 27, 1875. He was educated for the army, but refusing a soldier's life, he published at 20 his justification in *Les tablettes du juif errant* (1823). His next work was a translation of Herder's *Ideen zur Philosophie der Geschichte der Menschheit* (1827), to which he prefixed an introduction that won him the friendship of Cousin and Michelet. After travel in Germany, Italy, and England, he was sent by the French Institute to Greece (1829) and wrote *La Grèce moderne* (1830). He now began to contribute political essays to the newly founded *Revue des Deux Mondes* and recurred to the legend of the Wandering Jew in *Ahasvérus* (1833). This was followed by the less successful poems, *Napoléon* (1835) and *Prométhée* (1838). His *Examen de la vie de Jésus* is a philosophy of religion as the substance of humanity and the apotheosis of personality in answer to Strauss's *Leben Jesu.* His *Génie des religions* (1842) brought him a call to the Collège de France, where he roused great enthusiasm by lectures on the Jesuits, ultramontanism, and Christianity in relation to the French Revolution. At this period Quinet's partisanship began to bias his historical judgment. Michelet shared in his attack on the Jesuits, which was silenced by the government in 1846. Quinet took an active part in the revolution of 1848, sought to unmask Napoleon, and was banished (1852). At Brussels he wrote *Les esclaves* (1853) and *La révolution religieuse au XIXme siècle* (1857). Removing to Veytaux, on the Lake of Geneva, he published *Merlin l'enchanteur* (1860), the autobiographical *Histoire de mes idées* (1860), and *Histoire de la campagne de 1815* (1862) and *La révolution* (1865), both tracing national disaster to a disregard of righteousness. The fall of Napoleon III brought him back to Paris. He was active during the siege and in the National Assemblies at Bordeaux and Versailles. During this period he wrote *La création* (1870), *La république* (1872), and *L'Esprit nouveau* (1874). His *Mémoires d'exil* were published in 1870 and *Le livre de l'exilé* posthumously with two volumes of letters in 1877 and four others (1884–86). Quinet's complete works are in 26 volumes (Paris, 1877–79).

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QUINETTE DE ROCHEMONT, kē̇′nĕt′ de rŏ̇sh′môN′, Emile Théodore, Baron (1838–1908). A French engineer, born in Soissons and educated at the Ecole Polytechnique and at the Ecole des Ponts et Chaussées. He was appointed engineer in chief of the port of Havre in 1883, inspector general of bridges and roads in the Ministry of Public Works in 1892, and the same year took the chair of maritime works at the Ecole des Ponts et Chaussées. His writings include: *Mémoire sur le Clyde, Glasgow, Port Glasgow, et Greenock* (1869); *Notes sur les phares électriques de la Hève* (1870); *Notice sur le port de Havre* (1877); *Les ports maritimes de l'Amérique du Nord sur l'Atlantique* (3 vols., 1898–1903); *Cours de travaux maritimes* (2 vols., 1900–01); and books on various European ports.

QUINHAGAK. See Kuskokwim River.

QUINIC (kwĭn′ĭk) **ACID.** See Kinic Acid.

QUINIDINE, kwĭn′ĭ-dĭn. See Alkaloids; Quinine.

QUININE, kwī′nīn *or* kwĭ-nēn′ (Neo-Lat. *quinina*, from Sp., Portug., Quichua *quina*, quinine). A white, amorphous or crystalline powder with a very bitter taste, alkaline, very faintly soluble in water, but soluble in alcohol, dilute acids, ether, or chloroform, and derived from the bark of *Cinchona calisaya*, *Cinchona rubra*, and other varieties of Peruvian bark. The symbol of quinine is $C_{20}H_{24}N_2O_2 + 3H_2O$. There are five official salts. *Quinine sulphate* is the white, crystalline powder commonly called quinine, extremely and persistently bitter, slightly soluble in water (1 in 740 parts), moderately soluble in alcohol, soluble in weak acids. Its symbol is $(C_{20}H_{24}N_2O_2)_2{:}H_2SO_4 + 7H_2O$. *Quinine bisulphate* occurs in clear, colorless crystals or needles, very bitter and with an acid reaction, and is soluble in water and alcohol. The symbol is $C_{20}H_{24}N_2O_2.H_2SO_4 + 7H_2O$. *Quinine hydrobromide* occurs in colorless needles, bitter, soluble in 54 parts of water, freely in alcohol. Symbol, $C_{20}H_{24}N_2O_2.HBr + H_2O$. *Quinine hydrochloride* occurs in white needles arranged in tufts, bitter, soluble in 34 parts of water, freely soluble in alcohol, and suitable for hypodermic use. Its symbol is $C_{20}H_{24}N_2O_2.HCl + 2H_2O$. *Quinine salicylate* occurs as colorless needles, soluble in 77 parts of water, 11 of alcohol. It combines the therapeutic virtues of salicylic acid and quinine. Its symbol is $2C_{20}H_{24}N_2O_2.C_7H_6O_3 + H_2O$. *Quinine valerianate* was formerly official and occurs in white pearly crystals with the characteristic repulsive odor of valerian, bitter, soluble in alcohol and in 100 parts of water. Its symbol is $C_{20}H_{24}N_2O_2C_5H_{10}O_2 + H_2O$.

Among the unofficial salts of quinine are the amorphous borate and euquinine (the ethyl carbonate). There is also a compound, *quinine and urea hydrochloride*, freely soluble in water, suitable for hypodermic use, and much employed as a local anæsthetic.

Quinine is used in medicine as a bitter tonic, an antiperiodic, and antipyretic. It has antiseptic properties also. It depresses the heart when given in large doses, and after long-continued use it affects the auditory nerve. It is excreted with the urine and occasionally produces renal and vesical irritation. Small doses produce hyperæmia of the brain, with a feeling of exhilaration, while large doses cause cerebral congestion, with vertigo, staggering, headache, deafness, delirium, and even coma, constituting the condition termed cinchonism.

The principal use of quinine is in malarial affections, in which it reduces the fever, increases the number of white blood corpuscles, prevents the destruction of the red blood cells, and inhibits the growth of the plasmodia which cause the disease. The custom of taking quinine frequently for catarrhal attacks or as a prophylactic is very harmful. In chronic malarial states quinine is advantageously combined with arsenic.

Imports of quinine into the United States in 1915 amounted to 1,829,000 ounces, valued at $452,348.

Warburg's tincture (*tinctura antiperiodica*), a famous preparation, originally containing more than 60 ingredients, but now much less complex, is valuable in chronic malaria and as a tonic. Its principal ingredients are, besides quinine, opium, aloes, rhubarb, and camphor, together with a number of aromatics. See Alkaloids; Ague; Intermittent Fever; Malaria and Malarial Fever.

QUIN′ISEXT (from Lat. *quini*, five each + *sextus*, sixth). The name given in Church history to a council which, being regarded as a sort of supplement of the fifth and sixth general councils, is called by a title which combines both. The Fifth General Council, held in 553, on the subject of the three chapters, enacted no canons of discipline. In like manner the sixth, held against the Monothelites in 680–81, was confined almost entirely to doctrinal decisions. In order to supply the want a numerous body of bishops, more than 210 in number, assembled in 692, in a hall of the Imperial palace at Constantinople, called the Trullus, from which the council is sometimes known as the Trullan Synod. It was a purely Oriental council and was not approved by the Western Church and the Pope. Its decrees are purely disciplinary and it is important chiefly for its broad distinction between the legislation of the East and that of the West on the subject of clerical celibacy. The Quinisext Council, while prohibiting the marriage of any one who is in priest's orders, permits a married man to receive after marriage the order of subdeacon, deacon, or priest, but not of bishop (canon three). Against this the Roman pontiffs vigorously protested. Another peculiar canon of this synod (fifty-fifth) prohibits fasting on Saturday, even in Lent, and another, by decreeing that the ecclesiastical rank of a city followed its civil rank, gave Constantinople precedence over Rome. Consult H. K. von Hefele, *History of the Christian Councils*, vol. v (Eng. trans., Edinburgh, 1896).

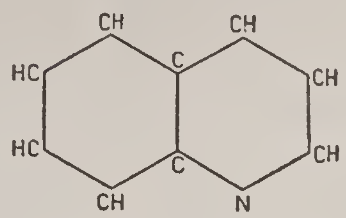
QUINNAT (kwĭn′ăt) **SALMON** (North American Indian name). The principal and typical species (*Oncorhynchus tschawytscha*) of Pacific coast salmon. See Salmon.

QUINN RIVER. See Great American Desert.

QUINOA, kē′nô-ȧ (Quichua name), *Chenopodium quinoa*. An annual plant, native of Chile and the high table-lands of Mexico, cultivated for its seeds, which, as meal, form an important food of the people where it is indigenous. See Chenopodium.

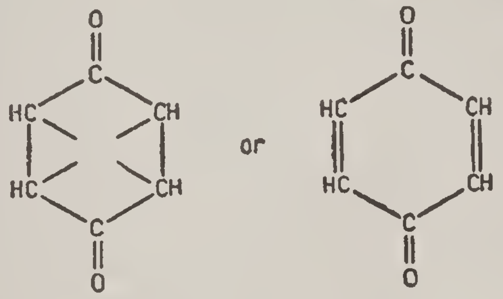
QUIN′OLINE, or Leucoline, C_9H_7N. An organic base to which many vegetable alkaloids are chemically more or less closely related. It may be obtained by the distillation of quinine, cinchonine, or similar substances with caustic potash. It occurs, together with isoquinoline, a substance of the same molecular composition as quinoline, in coal tar and in bone oil, and may be isolated in a somewhat impure state from the fraction distilled over between 236° and 243° C. (457° and 469.4° F.). It is now prepared on a large scale by an artificial method, known as Skraup's method. Pure quinoline has a specific gravity 1.095 at 20° C. (68° F.) and boils at 239° C. (462° F.). It is scarcely soluble in water, but dissolves freely in alcohol and in ether. It is a tertiary aromatic base and combines with acids to form crystallizable salts. The peculiar odor of quinoline is characteristic. Quinoline is used in the arts, especially in the manufacture of dyestuffs. In medicine it is used as an antiseptic and as a substitute for quinine.

The chemical constitution of quinoline is represented by the following graphic scheme:



It may be seen that the molecule of quinoline is composed of two nuclei, the benzene nucleus and the pyridine nucleus. The substance isoquinoline, mentioned above, has a much similar constitution and its chemical properties are much the same as those of quinoline itself; its boiling point is, however, 241° C. (466° F.); besides, at ordinary temperatures it is solid, its melting point being about 22° C. (71.6° F.). See Alkaloids.

QUINONES, kwĭn′ōnz (from Neo-Lat., Sp., Portug., Quichua *quina*, quinine). An interesting group of carbon compounds belonging to the so-called aromatic series. Theoretically the quinones may be defined as benzene derivatives in whose molecules two oxygen atoms are directly linked to the benzene nucleus. (See Carbon Compounds.) The simplest member of the group is the substance called benzoquinone, which may be readily prepared by the action of potassium bichromate and sulphuric acid on aniline. Benzoquinone has a peculiar, irritating odor; it melts at 116° C.; its molecular formula is $C_6H_4O_2$ and its chemical constitution is represented by one of the following graphic formulæ:



See Coal-Tar Colors.

QUIN′OTAN′NIC ACID. See Tannin.

QUIN′QUARTIC′ULAR CONTROVERSY. See Arminianism.

QUINSY, kwĭn′zĭ (formerly also *quincy*, *squincy*, from OF. *squinancie*, *esquinance*, Fr. *esquinancie*, from Lat. *cynanche*, from Gk. *κυνάγχη*, *kynanchē*, sort of sore throat, from *κύων*, *kyōn*, dog + *ἄγχειν*, *anchein*, to choke), Peritonsillar Abscess. An acute inflammation of the loose tissue surrounding the tonsil, terminating usually in suppuration. Quinsy is most prevalent between the ages of 15 and 40, children and old persons seeming to be exempt. The exciting cause is sudden and unequal exposure of the body to cold or wet. The affection is usually confined to one tonsil, but both may be successive or simultaneously involved. One attack predisposes to others. The disease is ushered in with feelings of chilliness and exhaustion, followed by a temperature of 102° or 103° F. These symptoms are accompanied by severe pain in the region of the tonsil. The latter becomes so swollen as to interfere with deglutition. The mouth can be only partly opened and with great pain, and the taking of food, except in liquid form, becomes impossible. The peritonsillar tissues become swollen and painful. The voice is muffled and indistinct, and sleep is almost impossible. Severe cases are marked by an intensity of all these symptoms, successive chills and sweats, delirium at night. Although the disease is acute and painful, it rarely proves fatal. Cases have occurred in which bursting of the abscess into the larynx during sleep produced instant death. The ordinary duration of suppurative tonsillitis is from five to eight days. At the end of this time the abscess bursts, all the symptoms disappear, and prompt recovery ensues. In its early stage the affection may often be cut short or aborted if prompt measures for relief are taken. These consist in rest, free purgation by a saline cathartic, followed by a single large dose of quinine; in addition the application of warmth and the use of antiseptic anodyne and astringent gargles. When suppuration has become inevitable, hot turpentine stupes or poultices applied over the angle of the jaw will hasten the formation of pus. When an abscess has definitely formed it should be freely incised and the pus evacuated. This procedure is attended with immediate relief. Chronically diseased tonsils should be removed to prevent future attacks, but some persons will have one or two attacks even after thorough enucleation of the tonsil.

QUIN′TAIN (OF. *quintaine*, *cuintaine*, from ML. *quintan*, quintain, Lat. *quintana*, street in the camp between the fifth and sixth maniples, containing the market and place for exercise, from *quintanus*, fifth, from *quinque*, five), or Quintin. An instrument used in the ancient practice of tilting on horseback or on foot with the lance. It consisted of an upright post surmounted by a crossbar turning on a pivot, which had at one end a flat board, at the other a bag of sand. The object of the tilter was to strike the board at such speed that he was past before the bag of sand, as it whirled round, could hit him on the back.

QUINTANA, kē̇n-tä′nȧ, Manuel José (1772–1857). A Spanish author and statesman, born at Madrid. He studied law at Salamanca and became a lawyer in Madrid, where his house was a resort of the advanced Liberals of the time. Among his earliest productions were his patriotic "Odes," which gave him a place in the first rank of Spanish poets and which were highly popular at the outbreak of the War of Spanish Independence. He also acted as secretary of the Cortes and regency and distinguished himself as editor of the *Semanario Patriótico* and as author of the manifestos of the insurrectionary juntas and of most of the official statements of the Cortes. On the restoration of Ferdinand VII in 1814, Quintana's liberalism caused his imprisonment at Pamplona for six years. Released in 1820, he was received in Madrid with acclamations, was appointed President of Public Instruction (1821), tutor of the Infanta Isabella (1833), and Senator (1835). He was also Director General of Public Instruction up to 1851. He died at Madrid. He will be longest known for his great work *Vidas de Españoles célebres* (3 vols., 1807–34). In addition he wrote several tragedies and edited a collection of Castilian poetry. The most complete edition of his works is that of Gonzales Rojas (3 vols., Madrid, 1897–98). Consult: *Obras inéditas de . . . D. M. J. Quintana precedidas . . . de un juicio crítico por . . . D. Manuel Cañete* (Madrid, 1872); Marcelino Menéndez y Pelayo, *D. Manuel José Quintana*, vol. iii of the *España del siglo XIX* (ib., 1887); Piñeyro, *Manuel José Quintana* (ib., 1892).

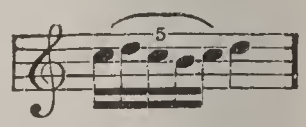
QUINTET′ (It. *quintetto*, from *quinto*, Lat. *quintus*, fifth, from *quinque*, five). A musical composition for five voices or for five instruments, all the parts of which are real. The instruments composing a quintet may be of various kinds, most frequently the regular string quartet with pianoforte. Quintets have been written also for two violins, two violas, cello (Boccherini); for two violins, viola, and two cellos (Schubert, op. 163); for two violins, viola, cello, and double bass (Onslow); and for one violin, viola, cello, double bass, and piano (Schubert, Trout quintet, op. 114). Often wind instruments also are introduced, as the string quartet with clarinet (Mozart). Mozart has written also a quintet for wind instruments only (oboe, clarinet, horn, bassoon) with piano. An effective quintet was written by B. O. Klein for voice (soprano), violin, cello, horn, and piano. The music written for a quintet is of the same character as that for a quartet (q.v.).

QUINTIL′IAN (Marcus Fabius Quintilianus (c.35–c.97 A.D.). A Roman rhetorician, born at Calagurris (the modern Calahorra) in Spain. He attended in Rome the lectures of Domitius Afer, who died in 59. After this date Quintilian revisited Spain, whence he returned in 68 to Rome, in the train of Galba, and began to practice as an advocate. He was distinguished as a teacher of elocution and his instruction was eagerly sought after among his contemporaries. Among his pupils were Pliny the Younger and the two grandnephews of Domitian. He was the first public teacher who benefited by the endowment of Vespasian and received a fixed salary from the Imperial exchequer, and as a mark of Imperial favor he was invested with the insignia and title of consul. His professional career as a teacher of eloquence, commencing probably in 69, extended over a period of 20 years, after which he retired into private life. The reputation of Quintilian in modern times is based on his great work entitled *De Institutione Oratoria Libri XII*, a complete system of rhetoric, which he dedicates to his friend Marcellus Victorius. In the first book he discusses the preliminary training through which a youth must pass before he can begin those studies which are requisite for the orator. The second book treats of the first principles of rhetoric and contains an inquiry into the essential nature of the art. The subjects of the five following books are invention (i.e., the determination by the orator of what he shall say) and arrangement; while those of the eighth, ninth, tenth, and eleventh are composition (embracing the proper use of figures of speech) and delivery. The last book is devoted to the various requisites for the formation of a finished orator. The entire work is remarkable for its sound critical judgments, its purity of taste, and the perfect familiarity it exhibits with the literature of oratory. The declamations, amounting to 164, which have been ascribed to Quintilian, are now believed to be spurious, as they evidently belong to different authors and even to different epochs. Early editions of Quintilian are those of Gronovius (Leyden, 1665); Burmann (ib., 1720); Spalding and Zumpt (Leipzig, 1798–1829), containing a lexicon. The best modern editions of the *Institutio Oratoria* are by Hahn (2 vols., Leipzig, 1868–69); Meister (2 vols., Prague, 1886–87); Bonnell (2 vols., Leipzig, 1896). Book I alone is edited by Fierville (Paris, 1890), Book III by J. A. Hild (Paris, 1885), Book X by Meister (Leipzig, 1887) and Peterson, with good introduction on Quintilian's life and style (Oxford, 1892), Books X and XII by Frieze (New York, 1889). The last English translation is by Watson (London, 1856). The *Declamationes* are published by Ritter (Leipzig, 1884) and Lehnert (1905). There is a complete edition by Spalding-Zumpt-Bonnell (1798–1834: 5th ed., by Meister, 1882). Consult: Henry Nettleship, *Lectures and Essays: Second Series* (Oxford, 1895); W. S. Teuffel, *Geschichte der römischen Literatur*, vol. ii (6th ed., Leipzig, 1910); Martin Schanz, *Geschichte der römischen Litteratur*, vol. ii, part ii (3d ed., Munich, 1913).

QUINTILIUS VARUS, Publius. See Varus, P. Q.

QUIN′TIN. See Quintain.

QUIN′TUPLET, or **QUIN′TOLE** (from Lat. *quintus*, fifth + *-plus*, -fold). In music, a group of five notes, formed of a note divided into five instead of its proper complement of four parts, the five notes having collectively the value usually expressed by four such notes. Thus, the five semiquavers of the following group are equivalent in value to a quarter note or four sixteenth notes:



QUIN′TUS CUR′TIUS RU′FUS. A Roman historian. See Curtius, Quintus.

QUIN′TUS ICIL′IUS. See Guichard, Karl Gottlieb.

QUINTUS SMYRNÆ′US (or of Smyrna). A Greek epic poet, probably of the close of the fourth century A.D. He wrote in 14 books the *Posthomerica*, which completes the story of the *Iliad*, drawing his material from the cyclic poets (q.v.) and patterning closely no doubt on the work of Arctinus and Lesches. Quintus is sometimes called Calaber, from the circumstance that a manuscript of his work was discovered at Otranto in Calabria. His poem, which is stiff and frigid, is best edited by Köchly (1850) and Zimmermann (1891). There is a translation by A. S. Way in the Loeb Classical Library (New York, 1913). Consult G. W. Paschal, *A Study of Quintus Smyrnæus* (Chicago, 1904), and Christ-Schmid, *Geschichte der griechischen Litteratur*, vol. ii, part ii (Munich, 1913).

QUINZE JOYES DE MARIAGE, kănz zhwä de mȧ′rē-ȧzh′, Les (Fr., The Fifteen Joys of Wedlock). A satire composed, in all likelihood, by Antoine de La Sale (q.v.) and written before 1461. It gets its title, profanely, from a prayer then widely known, *Quinze Joies de Notre Dame*. It is a kind of litany on the miseries of married life. Consult the edition by Henckenkamp (Halle, 1901).

QUIR′INAL (Lat. *Collis Quirinalis*). 1. One of the hills on which ancient Rome stood. It lies due north of the Palatine, and its western slope looks down on the Campus Martius, which stretches from its base to the banks of the Tiber. It was not included in the early Septimontium, or city of the seven *montes*, but was part of the city of the four regions and was of course included in the so-called Servian Wall. (See Rome.) The most notable ancient structures on the Quirinal were the temples of Quirinus (q.v.), Flora (q.v.), and Salus (Safety); and on the plateau from which both the Quirinal and the Viminal project, near the

Colline Gate, there was an ancient shrine of Fortuna. In Imperial times the great thermæ (or baths) of Diocletian and Constantine were built on the hill. Consult K. Baedeker, *Central Italy and Rome* (15th Eng. ed., Leipzig, 1909), and S. B. Platner, *The Topography and Monuments of Ancient Rome* (2d ed., Boston, 1911).

2. The residence of the King of Italy since 1870, previously a summer residence of the popes, which occupies a commanding situation on the Quirinal Hill. It was begun in 1574 by Pope Gregory XIII and was completed under Paul V. The architect was Domenico Fontana (q.v.). It was one of three papal palaces erected by him, the other two being those of the Vatican and the Lateran. The palace is modern in its arrangements and decoration. It contains a large ceiling painting, made by Overbeck (1859), commemorating the flight of Pius IX in 1848, a cast of Thorvaldsen's "Procession of Alexander the Great," and an "Annunciation" by Guido Reni.

QUIRI'NUS. In the early Roman religion, the name of the third great god, ranking next to Jupiter and Mars. Whatever the origin of the god, he seems to have been regarded as a parallel to Mars, representing rather the war god as in time of peace ready for the fray. The original prominence of Quirinus is shown by the fact that the third great flamen was devoted to his worship, which does not, however, seem to have been very exacting, as the flamen appears assisting at several other services unconnected with Quirinus. He was also honored originally by the Colline Salii (q.v.), as was Mars by the Palatine. His old temple lay on the Quirinal (q.v.), near the Porta Quirinalis. We hear of a new building in 293 B.C. and, after its destruction by fire, of the erection by Augustus of a splendid structure, which was dedicated in 16 B.C. Early in the first century B.C. the belief arose that Quirinus was the deified Romulus, a theory which was fostered by Cæsar and Augustus and led also to the association of an old goddess, Hora Quirini, with Hersilia, the wife of Romulus. The annual festival of Quirinius, the Quirinalia, was held on February 17, the supposed date of the translation of Romulus to heaven. Consult W. W. Fowler, *Roman Festivals* (London, 1899), and Georg Wissowa, *Religion und Kultus der Römer* (Munich, 1912). See ROMAN RELIGION.

QUIRITES, kwĭ-rī'tēz (Lat. nom. pl., probably from Sabine *quiris*, spear). The collective name of the Romans in their civil relations, while in connection with foreign affairs they were known as Romani. Quirites was, perhaps, the original name of a Sabine tribe, and the Roman nation, made up of Latin and Sabine elements, was called by the name of either of its component parts. The full official designation was *Populus Romanus Quirites*.

QUI TAM ACTION (Lat., who so well). An action brought under the provisions of a statute permitting an informer against an offender to receive a portion of the penalty prescribed for the offense and authorizing him to sue on behalf of himself and the government to recover the same. Offenders liable for a statutory penalty early sought to evade the law by procuring a friend to bring the action, under a collusive agreement not to enforce the judgment. To remedy this the Statute of 4 Hen. VII, c. 20, was enacted, providing that all such actions should be brought in the name of the King. This became the common law of the United States, and unless a statute expressly provides that the action shall be in the name of the informer, it must be in the name of the State, on relation of (*ex rel.*) the informer. These actions are to be distinguished from the so-called popular actions where the informer is entitled to the whole penalty. See PENALTY.

QUITCH. See AGROPYRON; COUCH GRASS.

QUITCLAIM. A deed of conveyance, deriving its title and in large part its form from the ancient instrument of release, whose operative words were "remise, release, and forever quitclaim." Though this language continues to characterize the quitclaim deed, it is in its operation, in many of the United States, much more than a deed of release and is in fact the form of conveyance usually adopted to make a grant of lands, answering the purpose of either a release or a grant. It is, indeed, the simplest form of transfer of a freehold. So far as the conveyance of the title is concerned it has all the effect of the more usual warranty deed, the advantage of the latter being that it adds to the mere conveyance the personal obligation of the grantor to warrant and defend the title transferred. See DEED; GRANT; RELEASE; WARRANTY.

QUIT'MAN. A city and the county seat of Brooks Co., Ga., 250 miles southeast of Atlanta, on the Atlantic Coast Line and South Georgia and West Coast railroads (Map: Georgia, C 5). It is the centre of a cotton-raising, lumbering, stock-raising, and farming territory and carries on an extensive trade in ham and bacon. Pop., 1900, 2281; 1910, 3905.

QUITMAN, JOHN ANTHONY (1799–1858). An American soldier and politician, born in Rhinebeck, N. Y. He was admitted to the bar in 1821 and removed at once to Natchez, Miss. In 1827 he was a member of the State Legislature, to which he presented the draft of a new militia system. From 1828 to 1834 he was Chancellor of the State, but resigned and was elected to the State Senate, of which he became President. For a few months he was acting Governor. Brigadier general of volunteers from the outbreak of the Mexican War, Quitman, when under discretionary orders, forced his way into the heart of the city of Monterey with 500 men, for which act a sword was later presented to him by Congress. He was brevetted major general in 1846 and subsequently led the assault at Vera Cruz, commanded the expedition against Alvarado, was with General Worth in the capture of Puebla, and served with distinction at Chapultepec, where he carried the Belen Gate. Upon the capture of the city of Mexico he was made its governor by General Scott. He had already become major general (1847). After his election as Governor of Mississippi in 1849, negotiations were carried on between Quitman and General López relative to a filibustering expedition to capture Cuba. Although the Governor, it appeared, had refused to head such a raid, he was indicted, resigned office, and was tried. The jury disagreed. In 1854 he was again interested in an expedition against Cuba and was arrested but not tried. From 1855 to 1858 he was a member of Congress and served as chairman of the Military Committee. Consult J. F. H. Claiborne, *Life and Correspondence of John A. Quitman* (2 vols., New York, 1860).

QUITO, kē'tō. Capital of Ecuador and of the

Province of Pichincha and see of the archbishopric of Ecuador, in lat. 0° 14′ S. and long. 79° 45′ W., about 165 miles in a direct line northeast of Guayaquil and 114 miles from the Pacific (Map: Ecuador, B 4). The city is built on very uneven ground in a lofty plateau surrounded by some of the highest peaks of the Andes. Its west part stands on the lower slopes of the volcano Pichincha. The climate is healthful, mild, and equable. The plan of the city is rectangular, with outlying suburbs. The streets, which run nearly with the cardinal points of the compass, are steep and generally impassable for wagons. Traversing the city east and west are two deep ravines, one of which is arched over. The bulk of the city consists of low, mean adobe houses, the better houses being covered with stucco or plaster. The style of the public buildings is characteristically Spanish. Of the several plazas the principal and largest is the Plaza Mayor, whose elevation above sea level is 9343 feet. Occupying the south side of this plaza is the cathedral; on the north side is the Archbishop's palace, on the west the government palace, and on the east the city hall. The Jesuits' church, with elaborately carved façade, is regarded as the best edifice in the city. There are various other churches and 11 large monastic establishments, of which 6 are for nuns. The convent of San Francisco is one of the largest in the world. At the head of the educational system is the university, an antiquated institution, which maintains faculties of law, medicine, and theology for a few students. Connected with the university are a library, a museum, an astronomical observatory, and a technical school. There are several seminaries, secondary schools, etc. There are a few manufactures, such as leather, saddles, shoes, ponchos, blankets, carpets, etc. The railway, 297 miles in length, connecting Quito with Durán, opposite Guayaquil, was completed in June, 1908. Various modern improvements, including electric lighting, have been installed. Pop., 1906, 50,841 (22,763 males, 28,078 females); of the total 1365 were foreigners, mostly Colombians. Estimated population in 1915, 70,000.

Quito is one of the oldest cities of South America. It was the capital of an ancient Indian nation before it was captured in 1470 by the Inca Tupac Yupanqui. It was the northern capital of the Incas until it was taken by the Spaniards in 1534. The city remained the capital of the Presidency of Quito till the end of Spanish rule in 1822. It has suffered repeatedly from severe earthquakes, notably in 1797, 1844, 1859, and 1887, and has also been ravaged by civil wars. Consult: Ternaux-Compans, *Histoire du royaume de Quito* (Paris, 1840); Herrera, *Apuntes para la historia de Quito* (Quito, 1874); C. R. Enock, *Ecuador* (London, 1914).

QUITRENT. Originally a fixed rent due from a freehold tenant to his feudal superior, so called because received in lieu of all other rents or services. It was a common feature of socage tenure and came in course of time to designate any fixed rent due from a socage tenant. Quitrents were protected from abolition by the provisions of the Statute of Military Tenures. It is probable, however, that they have become entirely obsolete in the United States, excepting in Pennsylvania, where they survive to a limited extent, though there is no legal objection to their survival elsewhere in the States formerly subject to socage tenure. Quitrents still exist to a considerable extent in England, though they have largely been redeemed under the provisions of the Conveyance Act of 1881. Consult the authorities referred to under REAL PROPERTY.

QUIT′TOR (connected with LG. *kwater*, *kwader*, rottenness). A fistulous wound at the top of the horse's foot resulting from bruises, and other wounds of the coronet, neglected corns, and unknown causes.

QUIX′OTE, *Sp. pron.* kĕ-hō′tȧ, DON. See CERVANTES.

QUOD′LIBET (Lat., what one pleases). A humorous combination of several melodies in use extensively during the sixteenth and seventeenth centuries. To-day it is a favorite amusement at a *commers* (a students' gathering) in Germany to continue the singing of a popular folk or drinking song until a certain word is reached, which happens to be the first word of another well-known song. The air is then broken off suddenly and the new air begun at that word, until another word again affords an opportunity to pass into a new air.

QUOITS, kwoits *or* koits (from OF. *coiter*, *coitier*, *quoitier*, to press, incite; probably from Lat. *coactare*, to constrain, frequentative of *coagere*, *cogere*, to urge, from *co-*, together + *agere*, to lead). A game played on a green at each end of which, 18 yards apart, a mark is placed. In formal matches it is required by some rules that this mark shall be an iron bar sunk into a bed of clay to the level of the surface. At this mark the quoits, iron concave rings not to exceed 8½ inches in diameter (of which the rim must not be more than 2½ inches in breadth), are pitched. Each player pitches two quoits in succession. The game is won by the side which, in a given number of pitches, gets the greatest number of quoits nearest the marks or pins. No quoit counts unless fairly delivered on the clay, free from the outer rim, and no quoit on its back counts unless it holds clay or is knocked out by another quoit. No quoit rolling on to clay counts unless it has first struck another quoit or the pin. In counting the two quoits nearest to the pin count one point each; a ringer, i.e., a quoit which has been pitched so that the pin shows through the open centre of the quoit, counts two points. These rules are modified to some extent by various associations. The sport is common in Europe and Scotland, and in the United States has been organized into an annual contest for the Bell quoit medal, given by David Bell, of Buffalo, N. Y., in 1868. Consult *How to Pitch Quoits*, Spalding's Athletic Library, Group 11, No. 167 (New York, issued annually).

QUORATEAN, kwō′rȧ-tē′*an*. See KAROK STOCK.

QUO′RUM (Lat., of whom, abbrev. of the ML. phrase *quorum A. B. unum esse volumus*, of whom we wish A. B. to be one). A legal and parliamentary term denoting the number of members of a public or private assembly whose presence is necessary for the transaction of business. In the case of private corporations the quorum necessary to enable the directors to transact business legally is fixed by the charter. In the case of private organizations it is fixed by their constitution or by-laws. In the case of legislative assemblies and constituent bodies it is generally fixed by the constitution, but is sometimes left to the determination of the assemblies themselves. The quorum is usually fixed at a majority of the legal number of members elected, although there are notable exceptions to this rule. In the Parliament of Great Britain the quorum is determined by each chamber for itself. In the House of Commons it is fixed at 40 members; in the House of Lords at 3. In the German Empire the Constitution fixes the quorum of the Imperial Diet at a majority of the legal number of members. The Federal Council is left to fix its own quorum and the practice requires simply the presence of the chairman, the Lord Chancellor. In France the determination of the quorum in the case of the French Parliament is left to each Chamber separately. By a rule of procedure it is fixed at a majority of the legal number of members of each House. In the United States the Federal Constitution fixes the quorum of the Senate and the House of Representatives at a majority of the whole number of members elected to each House. Until the Fifty-first Congress (1890) it was the practice in the House of Representatives, in ascertaining the presence of a quorum, not to count those present but not voting. This enabled the minority to obstruct the legislative procedure quite frequently and the practice became so annoying to the majority that Speaker Thomas B. Reed (q.v.) introduced the policy of counting, for the purpose of making a quorum, all members present and refusing a vote.

QUOTID'IAN FEVER. See AGUE; MALARIA AND MALARIAL FEVER.

QUO VADIS, kwō vä'dĭs (Lat., Whither goest thou?). An opera by Nouguès (q.v.), first produced at Nice, Feb. 9, 1909; in the United States, March 25, 1911 (Philadelphia).

QUO VADIS. A story of Rome in the time of Nero by Henryk Sienkiewicz (q.v.), named from the legend of St. Peter at Rome. Published in 1895, it has been translated into more than 30 languages, and was first dramatized in 1901.

QUO WARRAN'TO (Lat., by what warrant). A legal action or proceeding brought to determine the right of an individual or corporation to exercise a public office, franchise, or privilege, and to have a usurper removed by order of a court of competent jurisdiction. This remedy is said to have originated in the twelfth century in England, and was originally commenced by a writ issuing in the name of the crown and commanding the alleged usurper to show by what warrant he claimed the right or privilege in question. The inquiry was made by a royal commission, and the person named in the writ was often deprived of the rights he claimed without judicial proceedings. To remedy this a statute was enacted in the reign of Edward I requiring that such cases should be tried by a judicial action. This was begun by an "information in the nature of a quo warranto" filed by a public prosecutor on behalf of the crown. By a statute in the reign of Anne private individuals were permitted, on obtaining leave from court, to file such informations.

In most of the United States such proceedings are brought in the name of the Attorney-General of the State in his official capacity or in his name on relation of a private individual. These proceedings can only be brought in the highest courts of original jurisdiction or, in some instances, in appellate courts. In most States quo warranto proceedings may be brought against persons wrongfully claiming to occupy public offices; against the officers of private corporations where the latter assume unlawful privileges and powers; against the officers of public or municipal corporations, where franchises are unlawfully exercised by them; or against any person unlawfully claiming and exercising control over a public franchise or privilege such as a ferry franchise or banking privileges. The right of a foreign corporation to do business in a State may be questioned in this manner. Defeated candidates sometimes cause an investigation into the election returns and the rights of their successful opponents by quo warranto proceedings, but many States have provided special statutory proceedings for determining contested elections. A quo warranto proceeding can only be brought to try a right or eligibility to an office and not to remove a lawful incumbent for official misconduct. Consult: J. L. High, *Treatise on Extraordinary Legal Remedies* (3d ed., Chicago, 1896); T. C. Spelling, *A Treatise on Injunctions and Other Extraordinary Remedies* (2d ed., 2 vols., Boston, 1901); also statutes of the various States for details.

QVIGSTAD, kvĭg'stȧd, JUST KNUD (1853–). A Norwegian philologist and educator, born in Lyngen. Educated at the University of Christiania, he was rector of Tromsö Seminary for Teachers (1883–1909) and Minister of Public Instruction in W. Konow's ministry until 1912, when he resigned and returned to his rectorship. Qvigstad gained an international reputation by his knowledge of the Finno-Ugrian and Lappish languages and of the ethnography of these peoples, fields in which he published many works.

QVISTGAARD, kvĭst'gärd, J. W. VON REHLING (1877–). A Danish miniature painter, active chiefly in the United States. He was born at Ōrsholtgaard, Tikjob Parish, of a noble Danish family, and graduated from the Royal Agricultural College at Copenhagen. Against the wishes of his family he became a painter, studying for a short time with Johan Rohde in Copenhagen, after which he removed to America (1901). Although he was virtually self-taught, his art is distinguished by a superior technique, especially in draftsmanship. In an unusual manner he combines the excellent color and stippling methods of the old miniaturists with the broad and flowing brushwork of contemporary art. In 1906 he removed to London and thence to Paris. In 1909 he was summoned to Copenhagen to portray the King and Queen and other members of the royal family, including Prince Hans and Princess Marie. In 1912 he returned to New York, where he resided thereafter. Qvistgaard participated in the chief miniature exhibitions of Europe and the United States and held special exhibitions at Ghent (1913) and New York (1914). His best work comprises the miniatures of Dr. George C. Williamson (1907), the well-known authority on miniatures; Countess Danneskiold-Sansoe (1910); Mr. and Mrs. Charles M. Pratt of Brooklyn (1914); Mrs. Paul Reinhardt (1915); and an oil portrait of Theodore Roosevelt (1913).

R

R The eighteenth letter and fourteenth consonant of the English alphabet. It is the Latin form of the Greek *rho*, which corresponded to the Semitic *rēsh*, meaning head, the letter rudely representing a face in profile. For the development of the form of the letter, see Alphabet.

In phonetic value *r* may be either consonantal or vocalic, and in Sanskrit this distinction was denoted by different symbols. *R* is a consonant only when it immediately precedes a vowel, as *rill, rain, crack.* As a consonant it is a continuous spirant, voiced or voiceless, and is produced by allowing the breath to pass between the raised tongue point and the ridge of the upper gums. Initial English *r* is pronounced thus in such words as *ring, ribbon.* Trilled *r*, common to French and German, is produced by the vibrations of the tongue point or of the uvula. The latter is called the uvular *r* and is found only in French, where it has gradually replaced the lingual *r*. After vowels *r* is often sounded as the obscure vowel ə (= *a* in *sofa*), *care, hire, four.* English *r* in *red* is the medium alveolar sound, but after *t* in *try* and, to a less degree, after *d* in *dry*, the opening is so restricted that the sound is distinctly buzzed. *R* may be voiceless in combination with other voiceless letters, as *pride, try.* The so-called cerebral or cacuminal *r*, found in the modern Hindu dialects and in various parts of south England and America, is produced by elevating the tongue point towards the roof of the mouth. Sometimes the *r* is of a purely vocalic nature, forming syllables by itself. This vowel, found in Sanskrit and many of the Slavic dialects, forms the last syllable in the English *mother* and *father.* It is believed by many scholars to have existed in Indo-European.

R represents an original Indo-Germanic *r*, as Skt. *rudhira*, Gk. *ἐρυθρός*, Lat. *ruber*, Eng. *red;* Skt. *dvar*, Gk. *θύρα*, Lat. *fores*, Eng. *door.* It may also represent a Germanic *z* (Indo-Germanic *s*), which became *r* by the operation of Verner's law (q.v.). It is closely related to *l* (q.v.), with which it frequently interchanges, as in Skt. *rabh* and *labh*, to seize, especially as a result of dissimilation, as Gk. *κεφαλαλγία*, beside *κεφαλαργία*, headache, Latin *turtur*, English *turtle dove*, Lat. *lusciniola*, Fr. *rossignol.* The Greeks had two types of *r*, ῥ (rough breathing) and ῤ (soft breathing). The Romans transliterated the former (spiritus asper) by *rh*, whence the *rh* in words from the Greek through the Latin, as *rheumatism, rhetoric.* Words derived directly from the Greek, if recently acquired, usually disregard this Latin spelling, as *raphe.*

As a mediæval Roman numeral R = 80, R̄ = 80,000. R. A. = Royal Academy, Royal Arch, Royal Artillery; R. M., Royal Marines; R. N., Royal Navy; R. C., Roman Catholic.

In prescriptions ℞ (*recipe*) = take.

Consult: Maurice Prou, *Manuel de paléographie* (3d ed., Paris, 1910); Vietor, *Elements of Phonetics*, translated by Rippmann (5th ed., London, 1910); Daniel Jones, *Outlines of English Phonetics* (Leipzig, 1914); Passy, *Petite phonétique comparée des principales langues européennes* (2d ed., Leipzig, 1912).

RA, rä. An Egyptian deity. See Rê.

RAAB, räp. A royal free city in Hungary. See Györ.

RAABE, rä′be, Hedwig (1844–1905). A German actress, born in Magdeburg. She began to appear upon the boards in childhood and at 14 became connected with the Thalia Theatre at Hamburg, then with Wallner's Theatre in Berlin, and in 1864–68 was engaged at the Imperial German Theatre in St. Petersburg, whence she visited Germany annually on starring tours. Her great success on these occasions induced her to devote herself exclusively to this mode of professional life, in the course of which she acted also in the United States (1886–87). In 1871 she married Albert Niemann (q.v.). Although she did more than full justice to classical rôles, her forte lay in the representation of naïve parts and the youthful characters of modern French and German comedy.

RAABE, Wilhelm (1831–1910). A German novelist. He was born at Eschershausen, Brunswick, Sept. 8, 1831, and studied in Berlin. He first became known as Jakob Corvinus, the surname being a Latinization of his own. In 1901 the University of Jena conferred upon him the degree of Ph.D. *honoris causa.* He began his career with the very successful idyl *Die Chronik der Sperlingsgasse* (1857; 60th ed., 1912), which in the estimation of some remains his best work, and during the succeeding half century produced many novels and short stories which have become famous. Raabe died in Brunswick, Nov. 15, 1910. His work shows the influence of Jean Paul, E. T. A. Hoffmann, and K. Immermann, but his style, somewhat diffuse, is distinctly his own. In depth of feeling, richness of emotion, fullness of thought, and serious humor he is surpassed by few. He excels in the delineation of eccentric characters. Among his novels the most prominent are: *Der Hungerpastor* (3 vols., 1864; 30th ed., 1912); *Unseres Herrgotts Kanzlei*

(2d ed., 1879); *Abu Telfam, oder die Heimkehr vom Mondgebirge* (3 vols., 1867; 2d ed., 1901); *Der Schüdderump* (3 vols., 1870; 3d ed., 1901); *Alte Nester* (1879; 2d ed., 1903); *Das Odfeld* (1888). Among his tales may be mentioned *Horacker* (1876; 15th ed., 1910); *Im alten Eisen* (1887); *Stopfkuchen: eine See- und Mordgeschichte* (1891); *Die Akten des Vogelsangs* (1895); *Des Reiches Krone* (1896); *Die Gänse von Butzow* (1906). The tale *Altershausen* was published from his literary remains in 1911. Consult: Paul Gerber, *W. Raabe* (Leipzig, 1897); W. Brandes, *W. Raabe* (Wolfenbüttel, 1901, 1906); H. Hoffmann, *W. Raabe* (Berlin, 1907); H. A. Krüger, *Der junge Raabe* (Leipzig, 1911), bibliography in appendix; H. Spiero, *W. Rabbe* (Bielefeld, 1911); also R. M. Meyer, in *Die deutsche Litteratur der 19. Jahrhunderts* (Berlin, 1900).

RAASH, ra-äsh′. See ELECTRIC FISH.

RAB. See ABBA ARIKA.

RABAH ZOBEIR, rä′bä zṓ-bār′ (c.1846–1900). An African chieftain and the conqueror of Bornu (now in British Nigeria). At first he was a follower of Zobeir Pasha, whose slave-raiding forces he commanded in 1879 in Bahr el Ghazal. Defeated by the soldiers of the Khedive in that year, he then established himself in the southern part of Wadai. In 1891 he obtained 300 rifles that had been taken from a French explorer, Paul Crampel, who was killed; two years later he conquered the Sultanate of Bornu on the shores of Lake Chad, and in 1897 he forced the newly installed French resident at Lake Chad to flee. In 1899 and 1900 he fought three battles with a French expedition, and in the last engagement was killed.

RAB AND HIS FRIENDS. A touching short story of a dog by Dr. John Brown (q.v.), a Scottish physician, published in his *Horæ Subsecivæ* in 1855.

RABA′NUS (or HRABANUS) **MAURUS** (c.776–856). A great ecclesiastic and teacher of the ninth century. He was born at Mainz of noble family, began his education at Fulda, entered the Benedictine Order at an early age, and in 801 received deacon's orders. The following year he was sent to continue his studies at Tours, under Alcuin, from whom he received his surname, Maurus, after St. Maur, the disciple of Benedict. In 803 he became head of the school at Fulda, which flourished greatly under his direction. In 814 he was ordained priest; in 822 he was chosen abbot of Fulda, and performed his duties with much ability till 842, when he resigned and withdrew to the cloister of St. Peter to devote himself to literature. In 847 he became Archbishop of Mainz. He died at Winkel on the Rhine, Feb. 4, 856. Rabanus took an active part in opposing Gottschalk (q.v.) and his theories about predestination, and also the doctrines of Paschasius Radbertus with regard to the Eucharist. His voluminous writing, upon most diverse subjects, include a Latin-German glossary on the Bible, a sort of encyclopædia, *De Universo Libri XXII*, commentaries on the books of the Old and New Testaments, and poems. They are reprinted in Migne, *Patrologia Latina*, cvii.–cxii. His writings on education have been edited in German by Freundgen (Paderborn, 1889); his *De Institutione Clericorum Libri III* by Knoepfler (Munich, 1901). Consult for his poems, E. Dümmler, *Poetæ Latini Ævi Carolini*, vol. ii (Berlin, 1884); for his life, Friedrich Kuntsmann, *Hrabanus Magnentius Maurus* (Mainz, 1841); T. Spengler, *Leben des heiligen Rhabanus Maurus* (Regensburg, 1856); also A. F. West, *Alcuin and the Rise of Christian Schools* (New York, 1893), and Hastings Rashdell, in *Universities of Europe in the Middle Ages* (ib., 1895).

RABASA, rä-bä′så, EMILIO (1856–). A Mexican statesman. He was educated for the legal profession at the University of Mexico and devoted himself exclusively to international jurisprudence, in which field he became the leading Mexican authority. During the Díaz régime he was one of the founders and a leader of the Científico party, which exerted a powerful influence in the politics of Mexico. Besides works on law he wrote numerous novels. In 1914 he was one of the Huerta delegates to the conference at Niagara Falls called to discuss the relations of the United States and Mexico.

RABAT, rȧ-bät′, or NEW SALLEE (also REBAT, RBAT, ARBET, ETC.). A seaport and fortified town of Morocco, situated at the mouth of the Bu Regreg opposite Sallee (Map: Africa, D 1). It has numerous European houses, an arsenal, and a high minaret of the old Hassan mosque. The town is famous for its manufactures of carpets, mats, cloth, pottery, and morocco leather. The port is not easily accessible, but there is considerable import trade and a foreign trade in olive oil, wool, skins, and bones, the total exports in 1913–14 being valued at $177,705, while the imports totaled $4,839,040. Pop., 30,000, with 160 Europeans.

RABBAH, rä′bä, or RABBATH BENE AMMON (Heb. *Rabbath bĕnē ‘Ammōn*, Rabbah of the Ammonites). The chief city of the Ammonites, now known as Amman (Map: Palestine, D 4). It was east of the Jordan, about 25 miles northeast of the Dead Sea, in the valley of the Jabbok. In Deut. iii. 11 the iron bedstead of Og, King of Bashan, is mentioned as being at the time of the author in Rabbah of the sons of Ammon. The city was attacked and after a long siege captured by David and Joab (2 Sam. x–xii), who made the Ammonitish King a vassal (Amos i. 13–15; Jer. xlix. 2–3; Ezek. xxi. 20, xxv. 5). In the eighth and seventh centuries it was independent. Ptolemy II Philadelphus (285–247 B.C.) captured it, rebuilt it and called it Philadelphia, and for a long time it was a flourishing city. (See PHILADELPHIA.) Amman is to-day a prosperous town inhabited by Arabs and Circassians. There was another Rabbah or Rabbath in Moab, which was known to the Greeks and Romans, although not mentioned in the Bible; and still a third in the mountains of Judæa (Josh. xv. 60).

RABBI, răb′ī (Heb., Aram. *rabbī*, my lord). An honorary title applied to Jewish teachers of the law and, in general, to those versed in the law. In the days of Jesus the title had not yet acquired a strictly technical sense and is properly to be interpreted in the New Testament as a courteous title indicative of respect. Jesus himself is frequently addressed by his disciples as Rabbi (Matt. xxvi. 25, 49; Mark ix. 5, xi. 21, xiv. 45), and in John iii. 26 John the Baptist is called Rabbi. Rabboni, which is applied to Jesus in Mark x. 51 and John xx. 16, has the same force, but implies somewhat more of respect. In later times, in consequence of the dissolution of the temple cult, authority in religious matters fell into the hands of the scholars, and the title Rabbi acquired an official significance and became restricted to those authorized to decide ritualistic and legal questions. This usage arose in Palestine, apparently in the second century; in Babylonia the corresponding title was *Rab* or *Mar*. Through Palestinian influence the usage spread to other countries. Rabbi is still maintained, though not strictly, as the official designation of Jewish ministers; formerly it was applied to any scholar, whether engaged in the active ministry or not, and this is, in a measure, still the case in eastern Europe. For the education of rabbis academies were established in ancient times in Jamnia and Tiberias, in Sura, Nehardea and Pumbadita; and in 1915 there were seminaries and colleges at Breslau, Berlin, Vienna, London, Paris, Padua, Budapest, Cincinnati, Philadelphia, and New York. Consult: Emil Schürer, *History of the Jewish People in the Time of Christ*, vol. ii (Eng. trans., New York, 1896); G. H. Dalman, *Die Worte Jesu* (Leipzig, 1898); P. W. J. Fiebig, in *Die Religion in Geschichte und Gegenwart* (Tübingen, 1913).

RAB'BIT (connected with dialectic Fr. *rabotte*, ODutch *robbe*, Dutch *rob*, rabbit, Ger. *Robbe*, seal). A European animal (*Lepus*, or *Oryctolagus, cuniculus*) of the same group as the hare, but smaller and with shorter and more equal limbs, which differs essentially from all hares in the fact that the young are born blind and almost hairless, and in its gregarious and fossorial habits. The ears of the wild rabbit are only about as long as the head and show little black at the tips; the fur is grayish brown, growing whitish on the under part; the tail rather large and conspicuous, brown above, white beneath, and ordinarily held upright. The rabbit delights in sandy heaths, dry grounds covered with scattered bushes, and similar situations, where it digs burrows in colonies called warrens. It feeds mainly in the dusk of the morning and evening. It is monogamous and wild pairs are said to remain attached during life, but in domestication it ceases to pair. The fertility of rabbits is proverbial. They begin to breed when six months old and are capable of producing several litters of five to eight young in a year, so that in favorable circumstances they multiply with prodigious rapidity, and were they not killed off would inflict great injury upon crops, gardens, and orchards, especially by barking young trees. The flesh of the European rabbit is excellent food, and the hides and hair may be made useful. They do not become a pest, and in some places not suited to agriculture are raised as a commercial product. This species is a native of the western countries on the Mediterranean Sea, whence it has spread north in Europe. Its introduction and spread in Australasia furnish an extraordinary example of the effect which may follow naturalizing animals to a new country. About 1850 a gentleman living in New South Wales imported and turned loose three pairs of rabbits in that colony. They multiplied and flourished so rapidly that they quickly became a public plague. In New Zealand, indeed, where the rabbit obtained a foothold about 1875, it soon became a serious question whether farmers should not abandon some districts altogether. In order to combat the plague weasels and mongooses were extensively introduced, but these made comparatively little impression upon the hordes of rabbits, while they attacked the poultry, which was almost the only article of farm produce the rabbits had left untouched. An attempt was made to introduce epidemics of parasitic disease among the rabbits, but this also failed to reduce their numbers sufficiently. The only way to meet the pest has been to erect around every garden or farm a rabbit-proof wire fence.

An old English name for the rabbit is "cony," which has led to the application of this term in English versions of the Bible and in common speech elsewhere to quite different animals of small size and burrowing habits. In the United States the word is used interchangeably with "hare"—or, rather, replaces "hare" in popular speech, all the American wild species being called rabbits, though none of them are truly of that species.

Domestic Rabbits. There are 10 well-established varieties of domesticated rabbits, the original stocks of which were derived from almost as many countries. These are Angora, Belgian, Dutch, Himalayan, lop, Siberian, Patagonian, silvertip, Polish, and Flemish. Their characteristics are as diverse as their origin. They vary in color through every grade, shade, and mixture, from pure white to all black; in coat from the closest fur to long silky hair, capable of being woven; in style of ears from the prick ear, erect, small, and almost as stiff as metal, to the floppy, broad, soft-skinned ear of the lop, which hangs to the ground. The development of particular characteristics and markings and their maintenance are made possible by the animal's remarkable fecundity and adaptability. Their food is simple; a meal of whole oats in the early morning, a midday meal of greens and vegetables, and an evening one of a mixture of cornmeal, bran, and oatmeal, kneaded in warm water, meet nearly all their requirements. They are good mothers, need no attention, and the less they are then disturbed the better. The breeding hutch necessarily requires an inner room, dark except for such light as goes through the little round door. In that box, or room, she will make her own nest, and when her young have acquired their sight and fur (about the eighteenth day), they will come peeping out of the door. They should be taken away, one or two a day, when two months old. They can then run together until the fourth month, when the sexes must be separated.

The lop-ear is the oldest variety of the fancy rabbit, having been bred from the English wild rabbit and shown in England considerably over a century. Its most marked feature is the abnormal ears, each 11 to 12 inches in length and 6 in width. The ears fall gracefully from behind the inner corner of the eye, with the convex surface outward; towards the root the ear is narrow and thick, and becomes abruptly broader and proportionately thinner towards the tip. The body in this breed is rather low at the shoulder, and there is a dewlap. The color varies, but the markings should be uniform. A large lop weighs 11 pounds. This is the only variety which requires artificial heat for its full development, and, although the oldest breed, is so entirely artificial that it is maintained and perfected only by the utmost care.

The Belgian, although commonly called Belgian hare, is a true rabbit. It is of large size (10 pounds) and lustrous sandy brown in color. Its body is longer in proportion to its weight than that of any other rabbit, and the hind legs are long, strong, and straight. The head is rather broad, tapering to the nose, the ear about 5½ inches long, thin and transparent, and the eye brown and bright. The flesh is excellent.

Between 1895 and 1900 this rabbit was extensively introduced into the western United States.

The Dutch rabbit, derived from Holland, is one of the smallest of the fancy breeds, not averaging above four pounds. Its hind quarters are solid black, or blue, or lemon, or, rarely, tortoiseshell, except the toes of the hind feet, which are white; its forebody and forelegs are white; it has a white nose and white blaze narrowing to a point on its face between the ears. Its ears and the patch all round the eye and its side face are the color of its hind quarters. The whole-color areas must be absolutely free from black or white hairs, and their borders clear and sharply defined. They are a very hardy race and excellent mothers. The Angora, a curious long-bodied rabbit, is a native of Asia Minor and, like the Angora goat and cat, has a long silky coat, which is so long that it can be combed or clipped periodically and the wool woven. The hair is all white in typical examples, though sometimes black or fawn, and of two lengths, the first woolly and short, the second long and hanging in semicurls all over the body. When the wool is white the eye is pink; in other varieties it shades accordingly. They average about nine pounds in weight and are hardy. The Siberian rabbit, bred mainly in France and very prolific, is a cross between the Angora and the Himalayan, having the long silky hair of the one and the dark points of the other. The Himalayan's native home is northern China and Tibet, and he is bred in Europe for the value of his skin. His limbs, nose, ears, and tail are black, the rest of the body white. This black tipping has caused his skin, the coat of which is short and glossy, to be sometimes called mock ermine. The eye is a singularly rich golden crimson, bright and fiery. These rabbits breed as a rule very true, are smart, neat, hardy, and docile. They vary in weight from four to six pounds. The Patagonian derives its name from its great size alone, since it is really little else than a wild rabbit, bred up to 12 to 16 pounds in weight. The same may be said of the Flemish giants, some specimens of which weigh 18 pounds. They grow quickly and are profitable for market sale.

The silvertip is a fancy breed, characterized by upright ears, large prominent eyes, well-formed body, and a coat evenly silvered, with about 25 per cent of light hairs. When first born the silver grays are a slate blue, and after about a month they look quite black, but at their first molt this changes to a real silvering or light color, which is perfected by the second molt, when they show the much-desired blue tint. The silver browns are bred from the silver-gray bucks, crossed with deep-colored Belgian does. The cream or fawn varieties result from other cross breedings. They are medium-sized rabbits, seven pounds being the approved weight. The Pole is a delicate little all-white rabbit, often weighing only three pounds, which inhabits Poland in its wild state, but is distributed all through Switzerland and France, especially in Provence. The ears are short, upright, and soft, and the eyes are light red. See Plate of Hares and Pika.

Bibliography. Charles Rayson, *Rabbits for Prizes and Profit* (London, 1872); K. W. Knight, *Book of the Rabbit* (2d ed., ib., 1889); Morant, *Rabbit Farming* (ib., 1890); C. H. Lane, *Rabbits, Cats, and Cavies* (New York, 1903); W. E. Castle and others, *Studies of Inheritance in Rabbits*, published by the Carnegie Institution (Washington, 1909); B. A. Bensley, *Practical Anatomy of the Rabbit* (Philadelphia, 1910); G. A. Townsend, *Practical Rabbit Keeping* (New York, 1912).

RABBIT BOT. The larva of one of the botflies (*Cuterebra cuniculi*) which is commonly found under the skin of rabbits, where it forms a large tumor. The adult insect is a large fly, almost as large as a bumblebee and having some resemblance to that insect. The head is black and the thorax is covered with yellow-brown hair, the first segment of the abdomen with yellow hair, and the rest of the abdomen is blue black. See Bot.

RABBIT FISH (so called because the front teeth resemble the incisors of a rabbit). A rather large, coppery-brown fish (*Promethichthys prometheus*) of the Middle Atlantic, especially frequent about Madeira and the Bermudas. It is one of the escolars (see Escolar) and is known to Bermudans as catfish, but about Madeira is called coelho or conejo. Although it cannot be caught except on the bottom at depths of from 100 to 400 fathoms, it is one of the commonest and cheapest market fishes in the islands mentioned.

This name is given also to the common bur fish of the southern United States. See Porcupine Fish.

RABBITMOUTH. See Cutlips.

RABELAIS, rȧ′b’-lå′, François (c.1495–c.1553). A great French satirist and humorist, born at La Devinière, near Chinon, in Touraine. Rabelais's life has been so surrounded by legend that until the past few years it has been very difficult to distinguish facts from mere inventions. Thanks to recent discoveries, however, we are able to a certain extent to reconstitute the biography of this remarkable man. Though many dates have been assigned to his birth, 1495 is now generally accepted as the most probable, in spite of the fact that there are still some biographers who, following De Thou, prefer 1490. His father, Antoine Rabelais, lord of Lerné, was a prosperous lawyer of Chinon and had four children, three sons and a daughter. Tradition records that François began his studies at the Benedictine abbey of Seuilly about 1505 and passed thence to a similar institution at La Baumette, near Angers, where he made the acquaintance of the three Du Bellay brothers (see Bellay) and of Geoffroy d'Estissac, afterward Bishop of Maillezais. According to a legal document dated April 5, 1519, he entered that year the Franciscan monastery at Fontenay-le-Comte in Poitou, where he won the friendship of the influential lawyer André Tiraqueau and where, with another monk named Pierre Amy, he continued with enthusiasm the study of Greek, which, however, was frowned upon by the ecclesiastical authorities. The annoyances to which they were subjected by the other monks probably led the two enthusiasts to seek the protection of the distinguished scholar Budæus or Budé (q.v.) with whom they carried on a correspondence in Latin and Greek. But as the persecutions did not cease, Amy left the monastery, and Rabelais prevailed upon D'Estissac to secure from Clement VII permission to return to the Benedictines. This permission being granted him in 1524, he entered at once the abbey of Maillezais, and soon after became the secretary of his friend and protector D'Estissac, who lodged him in his château in the near-by village of Ligugé. This position afforded the young monk sufficient leisure to acquire the encyclopædic knowledge which characterizes his work. But after about four years of this quiet life he began to grow restless and, putting aside his habit, took up the life of a wandering student, visiting all the important university towns of the South for the purpose of improving his knowledge of medicine in which he had become greatly interested. He was welcomed everywhere not only because of his gay spirit, but especially because he knew six languages and was well versed in law, astronomy, and natural history. He finally went to Paris, probably early in 1529, with the intention of continuing his medical studies, but disappeared soon after the execution of Louis de Berquin, who was burned for heresy on April 17 of that year. We next hear of Rabelais as a medical student at Montpellier, where he matriculated on Sept. 17, 1530, and received his bachelor's degree on the first of the following November. Being required by the regulations of the medical school to deliver a course of lectures for three months, he chose the *Aphorisms* of Hippocrates and Galen's *Art of Medicine.* He brought his lectures to a close on June 24, 1531, and passed the summer of that year playing in a comedy entitled *The Dumb Wife.* On Oct. 23, 1531, he was again at Montpellier, but remained only a short time, going thence to Lyons, which at that time rivaled Florence as the great book centre of Europe. Here he issued his first important publications—the *Medical Letters* of Giovanni Manardi of Ferrara in June, 1532, a reprint of the *Aphorisms* of Hippocrates in July, and the *Last Testament* of Lucius Cuspidius in September. At the same time his humor was finding expression in popular almanacs, the underlying purpose of which was to make sport of astrologers and their art. One of these burlesques which he edited under the title *Les grandes et inestimables cronicques du grand et énorme géant Gargantua* was so successful that it led him a few months later (October, 1532) to write a sequel developing in a more elaborate form the account of Gargantua's son Pantagruel. This work, which was destined to form the second book of Rabelais's great satire, was entitled *Les horribles et espouvantables faicts et prouesses du très renommé Pantagruel, roy des Dipsodes.* Two years later, after having paid a visit to his native land, he developed the story of Gargantua, mingling in it some events which had recently transpired at La Devinière. Thus, the *Vie inestimable du Grand Gargantua, père de Pantagruel,* which is logically the first book of his great satire, was posterior chronologically to the second book.

Thanks to his learned publications, Rabelais was appointed in November, 1532, physician in the public hospital of Lyons, notwithstanding the fact that he did not yet have his doctor's degree. The esteem in which he was held by his contemporaries is shown by the letter that he addressed to Erasmus (q.v.) on the thirtieth of that month. It was probably about this time also that occurred the death of Rabelais's son Théodule, that mysterious "child of two months," eulogized in the Latin verses of the learned Toulousan jurist Boyssonné. The condemnation of *Pantagruel* by the Sorbonne on Oct. 23, 1533, probably inspired Rabelais to seek foreign climes. Anyhow in January, 1534, he accompanied Jean du Bellay, Bishop of Paris, on a special mission to Rome. Letters written by him during his sojourn in Italy contain interesting data on the plants and natural curiosities of the country. He also gathered materials for a topography of Rome in which he was unfortunately anticipated by a Milanese antiquarian named Marliani. However, immediately after his return to Lyons on April 11 of that year, Rabelais began to prepare a new edition of the work of Marliani, which appeared in September following. But the affair of the placards of Oct. 18, 1534, followed by months of severe persecution, interrupted the tranquil life of Rabelais. The expiatory procession of Jan. 21, 1535, in which the King and the royal family took part, served as a warning to all those suspected of heresy. Finding his situation precarious, Rabelais disappeared suddenly from Lyons, and accordingly the rectors of the public hospital were obliged, after waiting in vain for a month, to fill his position by electing a successor. In the middle of the summer of 1535 he was again in the retinue of Bellay, who was on his way to Rome to receive the red hat. After visiting Ferrara and Florence, the party reached Rome towards the middle of August. Rabelais corresponded diligently during his second Italian sojourn with the Bishop of Maillezais on matters of horticulture, politics, and Roman gossip, but chiefly concerning his efforts to secure from the Pope an indulgence to resume the Benedictine garb and to practice medicine, excluding surgery. This indulgence was finally granted him on Jan. 17, 1536, and before the end of the month of April Rabelais was back in France. It is quite probable that before August 17 following he was admitted as canon in the monastery of Saint-Maur-des-Fossés, of which Jean du Bellay was abbot. In February, 1537, he visited Paris and attended a banquet given in honor of the printer Dolet (q.v.), who had just been pardoned for having killed the painter Compaing. Two months later (April 3) he was back in Montpellier, where he received his doctorate from the faculty of medicine on May 22, returning in August to Lyons, where he came under the strict surveillance of the Cardinal de Tournon. Before the 27th of September he took up his duties as professor at Montpellier and began his courses on Hippocrates on October 18. After the close of his lectures on April 14, 1538, Rabelais took part as *maître des requêtes* in the interview between Francis I and the Emperor Charles V at Aigues-Mortes (July, 1538). He then seems to have followed the King and his court to Lyons, where we lose sight of him for some time. It is quite possible that he returned to Montpellier some time during the year 1539, for on August 13 of that year a student of the medical school chose him as his patron. However that may be, in July, 1540, he was at Turin, where he served as physician to the Viceroy of Piedmont, Guillaume du Bellay, brother of the Cardinal. According to the letters of Bishop Pellicier, Ambassador to Venice, Rabelais was then engaged by him to seek Hebrew, Syriac, and Greek manuscripts for the royal library at Paris. Accused, however, of having revealed important diplomatic secrets, he was obliged to return to France in December of that year in order to justify himself. Returning to Italy in March, 1541, he seems to have spent his leisure time in botanical expeditions and in studying the fortifications which were being constructed about Turin. His interest in military science led him to write a work in Latin on that subject which his friend Massuau translated into French and published in 1542 as *Stratagèmes.* Returning once more to France in November, 1541, this time in company with Guillaume du Bellay, he spent some time at Lyons preparing an expurgated edition of his *Gargantua* and *Pantagruel*, which had enjoyed a somewhat dangerous popularity. He then paid a short visit to his friend Etienne Lorens at the château of Saint-Ayl in March, 1542, and in May returned with Bellay to Piedmont, where he remained until the following December, when he was obliged to accompany his great patron, who had so generously remembered him in his testament, on his last journey to France. In spite of the attentions of the Honor of Medicine, as Rabelais was called by his contemporaries, Bellay died en route near Roanne on Jan. 9, 1543. Rabelais embalmed the body and accompanied the funeral cortège to Le Mans, where the obsequies took place on March 5. Notwithstanding the renown that was attached to his name by this important event, Rabelais disappeared entirely from view; and the next time we hear of him is Sept. 19, 1545, when Francis I granted him the privilege to print the *tiers livre* of Pantagruel, showing that even at that time the *Gargantua* was accounted the first and the original *Pantagruel* the second book. The auto-da-fé of Dolet (q.v.) on Aug. 3, 1546, frightened Rabelais, and he took refuge at Metz, where, according to a letter to Cardinal du Bellay dated Feb. 6, 1547, he was employed as a physician in the public hospital. But after April 10 he left that position and again disappeared. In January, 1548, he issued at Lyons the first 11 chapters of the *quart livre*, and in June accompanied Cardinal du Bellay to Rome, where he wrote a description of the great fête organized by the Cardinal to celebrate the birth of the Duke of Orléans on March 14, 1549. This was published during the same year as *La sciomachie et festins faits à Rome.* Soon after Bellay's return to France Rabelais was nominated curé of Meudon and Jambet (Jan. 18, 1550), obtaining at the same time (August 6) from Henry II the privilege to print the entire *quart livre.* What is probably the last book of his romance appeared finally on Jan. 28, 1552, but it immediately fell under the censorship of the Parlement of Paris (March 1) in spite of the eulogy of the King in the preface. The last years of Rabelais's life are involved in obscurity. It seems that he resigned his curacies on Jan. 9, 1553, and died the ninth of April following, although this date is not very certain. What purported to be a continuation of his masterpiece appeared in 1562 separately as *L'Isle sonante*, and in 1567 was incorporated with the rest as a fifth book. A recension of this book, differing considerably from the others and bearing the date 1549, was discovered in 1900. Though it is regarded as genuine by many of the best authorities, some recall that about that time Rabelais obtained a royal injunction against spurious works issued in his name and think this may be one of them. Parts of it are, however, fully worthy of him.

In *Gargantua* and *Pantagruel* broad humor is mingled with keen social satire, political insight, and pedagogic wisdom, but the work is conspicuously lacking in continuity. Rabelais was neither a drunken buffoon nor a profound philosopher as different legends have represented him, but a genius who expresses in a remarkable way, even though at times under the veil of nonsense, what his contemporaries were thinking and talking about. Though probably begun as a mere piece of humor, his masterpiece assumed in his hands a more serious tone as time went on. The first book treats of Gargantua, son of Grandgousier, a mighty giant who held sway over an insignificant district near Rabelais's birthplace. But along with the farcical adventures of that giant in his war with a neighboring monarch Picrochole, said to be a portrait of a member of the well-known Sainte-Marthe family, and the notable deeds of Frère Jean des Entommeures, the mighty eater and drinker, we have the founding of the abbey of Thélème and the quintessence of Rabelaisian social and pedagogical philosophy. The second book treats of Pantagruel, son of Gargantua, now called King of Utopia, and his faithful friend Panurge, a delightful creation, accomplished, shrewd, but without moral character. The third book contains less humor and more discussion. The debate of Panurge with himself and his counsel-taking with others as to whether he shall marry is perhaps the most famous passage of the romance. It naturally concerns the much mooted question of the position of women. As the heroes decide to consult the oracle of the Holy Bottle, the fourth and fifth books relate the trip to this oracle, based geographically, as M. Lefranc has shown, on the search for the Northwest Passage. When they finally reach the island they learn that the answer of the oracle is "Trinq" (drink). As nearly as may be Pantagruel is Rabelais, in whom humanism is opposed to modern faith. His very uncleanness of speech is the expression of a lusty animalism in revolt against mediæval asceticism, of a militant faith in nature and instinct, in whose sturdy humor and destructive satire is to be found the point of departure of eighteenth-century ethics and of modern realism. Notwithstanding, Rabelais was never in open opposition to the Catholic faith; he was a heretic *jusqu'au feu exclusivement*, who had no use for the severe puritanism of Calvin. Rabelais's influence on the development of prose literature was slight, but his Pantagruel, Panurge, Picrochole, and Frère Jean are imperishable creations.

Bibliography. The first annotated edition of Rabelais was by Le Duchat and La Monnoye (5 vols., Paris, 1711). Among subsequent editions may be noted those by Esmangart and Johanneau (variorum ed., 9 vols., ib., 1823–26); Burgaud des Marets and Rathery (2 vols., ib., 1857); Jannet (6 vols., ib., 1867); Montaiglon and Lacour (3 vols., ib., 1868–72); Marty-Laveaux (6 vols., ib., 1868–1903); and especially the critical edition by Abel Lefranc in collaboration with many others, of which only the *Gargantua* has appeared (2 vols., ib., 1912–13). This edition is to be complete in eight volumes. The best English translations are those of Urquhart and Motteux (London, 1653–94), of which the latest reprint is of 1904, and of W. F. Smith (2 vols., ib., 1893). For a bibliography of the early editions of Rabelais consult Baudrier, *Bibliographie lyonnaise* (11 vols., Lyons, 1895–1914), and P. P. Plan, *Bibliographie rabelaisienne, 1532–1711* (Paris, 1904). For his biography, consult Paul Stapfer, *Rabelais sa personne, son genie, son œuvre* (2d ed., ib., 1889); Emile Gebhart, *Rabelais: la renaissance et la réforme* (ib., 1895); Charles Whibley, in *Literary Portraits* (New York, 1904); A. A. Tilley, *François Rabelais*, in "French Men of Letters Series" (Philadelphia, 1907). Other works of importance are: Ligier, *La politique de Rabelais* (Paris, 1880); Le Double, *Rabelais: anatomiste et physiologiste* (ib., 1899); Coutans, *La pédagogie de Rabelais* (ib., 1899); Austin Flint, *Rabelais as a Physiologist* (New York, 1901); Abel Lefranc, *Les navigations de Pantagruel* (Paris, 1904); Louis Thuasne, *Etudes sur Rabelais* (ib., 1904); Lefranc and Boulenger, *L'Isle sonante* (ib., 1905); V. L. Bourrilly, *Lettres écrites d'Italie, 1535–1536* (ib., 1910); Jean Plattard, *Le quart livre de Pantagruel* (ib., 1910); id., *L'Œuvre de Rabelais: sources, invention, et composition* (ib., 1910); Louis Thuasne, *Villon et Rabelais* (ib., 1911); Pierre de la Juillière, *Les comparisons dans Rabelais* (Halle, 1911); id., *Les images dans Rabelais* (ib., 1912). For detailed bibliography and other special data consult *La revue des études rabelaisiennes*, ed. by Lefranc and others (10 vols., Paris, 1903–12), now continued as the *Revue du seizième siècle* (ib., 1913 et seq.).

RABENER, rä′be-nĕr, GOTTLIEB WILHELM (1714–71). A German satirist. He was born at Wachau, near Leipzig, went to school in Meissen with Gellert and Gärtner, and after finishing his studies in Leipzig, in 1741 entered the employ of the tax collector. He wrote for the popular periodicals of the day and especially for the *Bremer Beiträge* and Schwabe's *Belustigungen*. His papers are satiric, but neither bitter nor personal, and marked by clearness and force. While Goethe admired him he criticized the too frequent use of "direct irony." Several common proverbs may be traced back to Rabener. His papers were published at Leipzig (1751–55); with his *Satirische Briefe*, his personal correspondence, and a biography, they were edited by Weisse (1777); other editions followed down to 1840; selected satires (Leipzig, 1888).

RABENHORST, rä′ben-hôrst, LUDWIG (1806–81). A German botanist, who contributed greatly to the systematic study of cryptogams. He was born at Treuenbrietzen, Brandenburg, and after studying at Berlin bought a pharmacy at Luckau, where he lived and worked for 10 years (1830–40). Then, to devote himself entirely to botany, he removed to Dresden and afterward to Meissen. Rabenhorst wrote: *Deutschlands Kryptogamenflora* (1844–53); *Kryptogamenflora von Sachsen, der Oberlausitz, Thüringen und Nordböhmen* (1863–70); *Flora Europæa Algarum Aquæ Dulcis et Submarinæ* (1864–68); *Mycologia Europæa* (1869–82), with Gonnermann; as well as works on general botany. In 1852 he founded the journal *Hedwigia*.

RABIES, rā′bĭ-ēz. See HYDROPHOBIA.

RABSHAK′EH (Heb. *Rabshākēh*, Bab.-Assyr. *rab-shākē*, chief of the captains). A word which occurs in the Old Testament (2 Kings xviii–xix and the parallel passage, Isa. xxxvi–xxxvii) as the title of the officer sent by Sennacherib with Tartan and Rabsaris (likewise titles of high officials) to demand of Hezekiah the surrender of Jerusalem. The Rabshakeh is represented as delivering his message in Hebrew, in the presence of the people, and when requested to speak Aramaic, at the time the language of diplomatic interchange, so as not to alarm the people by the threats of the Assyrian King, insolently declines to do so. It follows from the choice of the Rabshakeh to convey the message of Sennacherib that he was a high dignitary in the Assyrian army, though not the highest, and this view is confirmed by the occurrence of the title both in Assyrian historical texts and in legal documents and also in lists of officials (e.g., Rawlinson, II, pl. 31, no. 5, 34a). Exactly what position the Rabshakeh occupied is not known, though it is probably not far wrong to regard him as a general staff officer, subject only to the Tartan. The old rendering, "chief cupbearer," is certainly wrong and must be abandoned. Consult Schrader, *Cuneiform Inscriptions and the Old Testament* (Eng. trans., London, 1885–86), and the commentaries on Isaiah and the Books of Kings.

RABUTIN, rȧ′bụ′tăN′, ROGER, COUNT DE BUSSY-. See BUSSY-RABUTIN.

RABUTIN-CHANTAL, MARQUISE DE. See SÉVIGNÉ, MARIE DE RABUTIN-CHANTAL.

RACALMUTO, rä′kȧl-mōō′tō. A town in the Province of Girgenti, Sicily, situated on the crest of a hill, 12 miles by rail northeast of Girgenti. There are salt, sulphur, and quicksilver mines and a trade in wine and oil. Pop. (commune), 1901, 15,938; 1911, 16,028.

RACAN, rȧ′käN′, HONORAT DE BUEIL, MARQUIS DE (1589–1670). A French poet, born at La Roche Racan, Touraine. He was a page to Henry IV and in that capacity met Malherbe, whose disciple he became. He served in the army for several years and then retired to his estates. *Les Bergeries*, perhaps the best pastoral play in French, appeared in 1625. It is studied from nature and is his best production. But he had not the sustained force to write a great work and he had little education. This becomes apparent in *Les sept psaumes* (1631), *Odes sacrées tirées des psaumes de David* (1651), and *Dernières œuvres et poésies chrétiennes* (1660), where his limited knowledge of Latin is evident.

RACCONIGI, rȧk′kō-nē′jē. A town in the Province of Cuneo, Italy, situated on the Maira, 21 miles by rail south of Turin (Map: Italy, A 2). Its palace, surrounded by a park, is the country residence of the King of Italy. The town has a Gymnasium, a technical school, and a large hospital. Silk fabrics, woolen cloths, and shoes are manufactured. Pop. (commune), 1901, 9009; 1911, 10,605.

RACCOON′ (from American Indian *arathcone*, *arrathkune*, raccoon). A small American carnivore (*Procyon lotor*), closely related to the bears. The family (Procyonidæ) is American, with the single exception of the Himalayan genus *Ælurus*. (See PANDA.) The raccoon is to be found all over the wooded parts of temperate North America and most of Mexico, and a second species frequents tropical America. It is about the size of a cat, but more robust in appearance because of its long fur and the semiplantigrade feet. The general color is a grizzle, as the grayish hairs are tipped with black; but on the nose and cheeks there are black and white patches, which, with the erect ears, give the countenance a shrewd expression, well justified by the cunning and mischief-loving activity of the little beast. Although it spends much of its time on the ground in search of small animals, insects, and vegetable dainties, it climbs well and makes its home in the hollow of a tall tree, where it sleeps during the day, and hibernates in the colder parts of the country. In the late summer and early fall the raccoon shows a special fondness for ripening corn. At this season also frogs, crayfish, and wild oysters form a large part of their fare. A singular practice of the raccoon is that of washing everything it eats before putting it into its mouth. Should there be no water at hand, the animal will go through the motions of washing it, rubbing the morsel between its hands until it considers it perfectly clean. It is fond of water and is a good swimmer.

The hunting of raccoons, which usually is done with dogs, is one of the favorite American sports, especially in the Southern States. This chase is more a matter of sport than of profit, although the fur of the raccoon has a considerable value. In Europe the hair also is extensively used in the manufacture of hats. South America has a similar species of raccoon (*Procyon cancrivorus*), locally called the crab-eater, which is found in all parts of that continent east of the Andes. It takes its name from its great fondness for the land crabs which abound in South America and upon which it mainly exists.

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RACCOON DOG. A small, short-eared wild dog (*Canis procyonoides*) of Japan and the Chinese coast, which has a curious resemblance in form and color to the raccoon. It haunts the banks of rivers and the seacoast and feeds at night mainly on fish in winter and on mice in summer. It lives in burrows and is said to hibernate, but this assertion needs confirmation. It is not shy, is easily trapped, and its fur and flesh are highly esteemed, especially in Japan.

RACCOON OYSTER. A name given to oysters which grow above low-water mark, where they become stunted by daily exposure to the air.

RACCOON PERCH. See PERCH.

RACE, CAPE. See CAPE RACE.

RACE HORSE. See STEAMER DUCK.

RACES OF MANKIND. See MAN, SCIENCE OF; LIVING RACES.

RA′CHEL (Heb. *Rāḥēl*, ewe). A daughter of Laban and the favorite wife of Jacob (Gen. xxxix. 6 et seq., 30), mother of Joseph (ib. xxx. 22 et seq.) and Benjamin (ib. xxv. 16 et seq.). Jacob served Laban seven years for her, and then, receiving Leah in her stead, was obliged to serve seven years more for Rachel. As Rachel was barren, she gave her husband Bilhah, a servant, for concubine, and thus became the putative mother of Dan and Naphtali (ib. xxx. 1–8). Through mandrakes obtained from Reuben her womb was finally opened (ib. xxx. 14 et seq.). She died in Canaan after giving birth to Benjamin (ib. xxxv. 18). Her tomb is said to have been at Zelzah in the border of Benjamin not far from the sacred tree of Tabor, in the neighborhood of Bethel (1 Sam. x. 2), between Bethel and Gibeah and in the direction of Migdol Eder, which, according to Mic. iv. 8, seems to have been Jerusalem. It is evident both from 1 Sam. x. 2 and Jer. xxxi. 15 that her sepulchre was near Ramah. In Gen. xxxv. 19 and xlviii. 7 she is said to have been buried "in the way to Ephrath, which is Bethlehem." Many interpreters regard "which is Bethlehem" as a later gloss and think that an Ephrath north of Jerusalem is meant. The existence of a tribe in Bethlehem by the name of Ephrath would account for the gloss. There is likely, however, to have been a tomb of Rachel in Bethlehem as the reference of the passage in Jeremiah to the massacre of infants in Matt. ii. 18 would show. Whether the other passages all refer to the same place or to different tombs cannot easily be determined. It is thought by some scholars that Rachel = Ewe originally was the totem of an important clan and as such may have been worshiped at more than one tomb, both within the territory of the tribes Joseph and Benjamin and at Bethlehem, which once may have belonged to Benjamin (*Bĕnē Yamin*, sons of the south). The Rachel clan itself was probably absorbed in Joseph and Benjamin, though families in Dan and Naphtali may have claimed the same descent. There is a *Kubbet ʻAbd el ʻAziz* north of Jerusalem also called *Kubbet Rachil* (tomb of Rachel); the structure at Bethlehem called *Kubbet Rachil* dates from the twelfth century A.D., but may be on the site of an earlier tomb. Consult Eduard Meyer, *Die Israeliten* (Halle, 1906), and H. Gunkel, *Genesis* (3d ed., Göttingen, 1910).

RACHEL, rá′shĕl′ (1821–58). A French tragic actress, whose real name was Elisabeth Rachel-Félix. She was born of Jewish parents at an inn in the Swiss village of Mumpf (Feb. 28, 1821). Her father was a peddler. The family settled for a time at Lyons, where she and her elder sister Sarah used to sing in the streets and cafés. In 1830 they went to Paris. There her singing attracted the attention of Choron, an eminent teacher of music, and he took her as a pupil. Her voice at first was not very promising, but her dramatic gifts were evident, and she began studying under Saint-Aulaire, the actor. Later she was a pupil in the Conservatoire. In 1837 she secured a position at the Gymnase and made a début which excited no great attention. A few critics, however, perceived her genius, among them Jules Janin, and Mademoiselle Mars (q.v.) likewise foresaw her future greatness. On June 12, 1838, she made her appearance upon the stage of the Comédie Française as Camille in Corneille's tragedy of *Horace*. In this rôle and in a series of other impersonations from the classic repertory she achieved great success, and popular admiration of her performances grew to such enthusiasm that for years she was without a rival in the great tragic rôles of Corneille, Racine, and Voltaire. It was in Racine's *Phèdre* that the zenith of her artistic career was reached (1843). Another of her triumphs was in *Adrienne Lecouvreur*, which was written for her by Scribe and Legouvé, but in other modern rôles she was less fortunate. Her relations with her colleagues at the Théâtre Français were not always pleasant. In her tours abroad she met with great success, especially in England in 1841 and later and in Russia in 1852. Her health and popularity in Paris were both failing when in 1855, the year of Adelaide Ristori's first Parisian appearance, Rachel undertook a tour to America with her brother Raphael as manager. She was warmly greeted, though the financial returns were disappointing. Soon utter physical prostration necessitated her return to France. A visit to Egypt failed to restore her, and she died of consumption at Canet, near Toulon, Jan. 3, 1858.

As an artist, within the limits prescribed by her genius, Rachel was perhaps never equaled. "She does not act—she suffers," one said of her. Her *Phèdre* was a portrayal of human agony never to be forgotten.

Matthew Arnold's three sonnets upon her are well known. Consult the *Memoirs of Rachel, by Madame de B——* (Eng. trans., New York, 1858), which are not, however, altogether reliable; Janin, *Rachel et la tragédie* (Paris, 1858); D'Heylli, *Rachel d'après sa correspondance* (Paris, 1882); Kennard, *Rachel* (Boston, 1888); De Mirecourt, "Rachel," in *Les contemporains* (Paris, 1854); De Faucigny-Lucinge, *Rachel et son temps* (Paris, 1910); F. H. Gribble, *Rachel: Her Stage Life and her Real Life* (New York, 1911).

RACHITIS, rȧ-kī′tĭs. See Rickets.

RACHMANINOV, räk-mä′nē-nôf, Sergei Vasilyevitch (1873–). A Russian composer of the new school. He was born on a small estate in the Government of Novgorod and very early showed his musical bent. At the age of four he studied the piano under his mother, and at nine, after some professional private instruction, he entered the St. Petersburg Conservatory. From there he went to the Conservatory of Moscow, studying piano under Zvyerev and Siloti (pupils of Liszt and Rubinstein) and composition with Taneiev and Arensky (q.v.). His graduation thesis was the one-act opera *Aleko* (libretto after Pushkin), which was honored by almost immediate production (1893). Thereafter he taught piano at a Moscow girls' institute for 10 years (1893–1903), conducted the Moscow Private Opera for two seasons (1897–99) and the Moscow Imperial Theatre for two more (1904–06), severing all these connections because they hindered his creative work. He traveled extensively, however, appearing as pianist and conductor in the principal cities of Europe and America. In 1907 he settled in Dresden. Rachmaninov's music is remarkable for rhythmic variety, richness of color, and harmonic effects, while in power of thematic invention he surpasses all living Russian composers. His strong individuality saves him from the allurements of impressionism, to which many of his contemporaries have yielded. His works comprise three operas, *Aleko, The Niggardly Knight*, and *Francesca da Rimini;* two symphonies; a symphonic poem, *The Isle of Death;* a fantasia for orchestra, *The Cliff;* a Bohemian caprice, *Gypsy Capriccio;* considerable chamber music, including the *Elegiac Trio* in memory of Tschaikowsky; three piano concertos and much other music for the piano; songs and mixed choruses, and two cantatas, *Springtime* and *The Bells*, the latter after Edgar Allan Poe.

RACINE, rȧ-sēn′. A city and the county seat of Racine Co., Wis., 23 miles south-southeast of Milwaukee, on Lake Michigan, at the mouth of the Root River, and on the Chicago and Northwestern and the Chicago, Milwaukee, and St. Paul railroads (Map: Wisconsin, F 6). Among the institutions of the city are St. Luke's Hospital, St. Mary's Hospital, the Taylor Orphan Asylum, two public libraries, Luther College, and Racine College (Protestant Episcopal) and St. Catherine's Academy (Roman Catholic), with their noteworthy libraries. The post office, Y. M. C. A., and Horlicks, Washington, and Riverside parks are among the other noteworthy features. Racine possesses a good harbor and is connected by steamship lines with other lake ports. Its trade is chiefly in the principal manufactured articles and in farm and dairy products. It ranks second among the cities of the State in manufactures, the output of its varied industries in the census year 1914 having had an aggregate value of $43,632,000 and the invested capital having amounted to $67,635,000. The leading manufactures include agricultural implements, carriages and wagons, boilers, foundry and machine-shop products, boots and shoes, leather, trunks and valises, automobiles, clothing, infant foods, steel springs for cars and carriages, hardware, lumber products, tires, gas engines, furniture, etc. Settled in 1834, Racine became a village in 1843 and a city in 1848. The government, under a revised charter of 1905, is vested in a mayor, elected every two years, and a unicameral council. Of the administrative officers the fire and police commissioners are appointed by the mayor and the board of education by the mayor with consent of council. Pop., 1900, 29,102; 1910, 38,002; 1915 (U. S. est.), 45,507.

RACINE, rȧ′sên′, Jean (1639–99). One of the greatest of French dramatic poets. He was born Dec. 21, 1639, at La Ferté-Milon (old Duchy of Valois), and died April 26, 1699, in Paris. He received his primary education in Beauvais, at a school affiliated with the Jansenists of Port-Royal; then he passed at 15 to the more immediate direction of the Port-Royalist teachers at l'Ecole des Granges, where he was taught by the noted Greek scholar Lancelot, the Latinist Nicole, who was a distinguished moralist, and others skilled in the pedagogy of their time. They left indelible marks, not alone on Racine's mind, but on his character as well, for the great fact that dominates his whole life is his relation, intellectual and moral, to those solitaries of Port-Royal in whom persisted the Puritan element in the French church. Sometimes an obedient, sometimes a revolting disciple, he was never indifferent to these influences of his youth. He died in their fold, and his grave bore the inscription, "Poet, Recluse of Port-Royal."

At l'Ecole des Granges and later at the Collège d'Harcourt Racine "read and annotated all the ancient classics." He learned by heart long passages from Greek romances and declaimed to astonished friends the choruses of Sophocles, who, with Euripides, remained his dramatic model. He acquired also a puritanic tenacity of mind and uncompromising uprightness and a reasoned devotion. Yet he had brilliant social gifts, and on his graduation (1658) worldly attractions so prevailed on him that his kindred took alarm. They sent him into a kind of exile at Uzès in Languedoc, where he hoped for a benefice from his uncle, vicar-general of the diocese. His faults, from a Jansenist point of view, appear to have been intimacy with La Fontaine, Chapelain, other men of letters, and some actors and actresses, and the directing of his talent to dramatic composition and to poems for the court, especially *La nymphe de la Seine* on the marriage of Louis XIV.

Fifteen months in Languedoc brought Racine no benefice, but he completed his literary education. He read diligently the Greek, Latin, and Italian poets and historians and the Church Fathers. He returned to Paris (1662) an accomplished scholar, dominated by social and poetic ambition. He was presented to the King, became a fashionable poet and the intimate of Chapelle, Furetière, Molière, and, above all, of Boileau, who formed in the successful poet a new and fruitful theory of dramatic art. In

1664 he obtained a pension and he was a frequent recipient through life of "gratifications" from the court. His earliest play, *La Thébaïde*, on the strife of Eteocles and Polynices, was acted by Molière's company in 1664. His second play, *Alexandre le Grand*, was first performed Dec. 4, 1665, by the comedians of the Palais Royal. December 18 they were astonished to find out that it was being given by a rival company at the Hôtel de Bourgogne. How this came about is unknown, but it ended in a complete breach between Molière and Racine, the latter of whom seems to have been in the wrong, and who presently showed himself as an unfriendly rival to Corneille and as an unseemly satirist of his old teachers, the Port-Royalists, in a reply to Nicole's *Lettres visionnaires* on the evils of the stage. He wrote also a second reply which Boileau saved him from printing, telling him that it might be a credit to his wit, but was surely none to his heart. He later repented deeply this most discreditable incident in his life. But his irritation at the attitude of his kinsfolk at Port-Royal made his thought more tragically sombre, and while the poet in him was wrestling with the Puritan he wrote *Andromaque* (1667), the first of his seven great plays.

Of Racine's life from 1667 to 1677 we know very little. He lived in close intimacy with at least one actress and produced his only comedy, *Les plaideurs* (1668), and the tragedies *Britannicus* (1669), *Bérénice* (1670), *Bajazet* (1672), *Mithridate* (1673), *Iphigénie* (1674), and *Phèdre* (1677). This last was opposed by a cabal who supported a rival and worthless *Phèdre* by Pradon. Nettled at this or because of a moral dissatisfaction with the result of his theory of dramatic art, Racine withdrew from the stage, made his peace with Port-Royal, and married a worthy woman with more money than culture and more good nature than either. Racine's domestic life was happy. He had seven children and a sufficient income from sinecure offices and from the post of royal historiographer, which he shared with Boileau. This involved the duty of accompanying the King to his various "sieges," but what Racine wrote was accidentally burned. In 1685 he pronounced in the Academy, of which he had been a member since 1673, a fine eulogy on Corneille, and in 1689 made a kind of return to the stage with *Esther*, written to be acted by the girls at Madame de Maintenon's school at Saint-Cyr. It was a biblical dramatic poem and very successful. *Athalie*, a similar and greater piece (1691), was much less successful. Neither was publicly produced in Racine's lifetime. In his last years he grew ever more devout, wrote four *Cantiques spirituels* and an *Histoire abrégée de Port-Royal*. For this or some other reason he lost court favor. Tradition says it was for preparing a memoir on the miseries of the people. In March, 1698, he sought to clear himself of complicity in the Jansenist heresy in a long letter to Madame de Maintenon.

A careful examination of Racine's life and letters reveals a puzzling duality, a serious soul and a mobile mind. He was not merely religious; he was credulous and superstitious. He was more than loyal to the King; he was his toy. He was vain, irritable, timid, easily influenced by those he loved or feared. He was gentle and lovable, but the kind of moral goodness that he had was wholly consistent with moral weakness. His mind was keen, supple, strong, with good power of psychic analysis, remarkable delicacy of sentiment, and an exquisite though narrow sense of literary art. The best of him is in his work, a rare combination of wit and feeling, energy and poise, imagination and self-restraint, eloquence and repose.

The production of *Andromaque* makes Nov. 17, 1667, one of the great dates in the history of the French stage. It marked a new conception of the tragedian's art. For Corneille's heroic tragedy is at that moment contrasted with Racine's tragedy of love. Corneille stands for the triumph of will, Racine for the inevitableness of destiny and of passion. This conditions his dramatic form. Since he deals with the universals of human nature, he chooses a conventional environment, whatever least distracts attention and least binds the development and play of passion. With comedy it is different. He puts the scene of *Les plaideurs* in the Paris of his day.

The dominance of passion over will is accepted more readily in women than in men, and Racine's great characters are nearly all women. This is preëminently true of *Phèdre*, *Andromaque*, and *Iphigénie*, his three most popular tragedies. It is true, too, though in a different way, of *Athalie* and *Esther*.

Racine's plays are simple. Each is a problem which the dramatist solves in a way often more consistent with logic than with psychology. Thus the dramatic element is enhanced, for Racine touches only such features in his characters as shall make them stand out clearly and do nothing to hinder the development of his plot. Every person behaves with the utmost decorum; not one of them says anything inelegant or unrefined; there are no visible bloody deeds, no roughness even, and no jesting nor comedy. Herein Racine's men and women constitute an ideal or rather an unreal society; perhaps it were better to say a society from which such features as did not fit Racine's æsthetic theories are absent. Again, Racine took all his tragic themes from ancient history or legend, but his tragedies are nevertheless of the seventeenth century. Frenchmen in French apparel are called Nero and Achilles. *Iphigénie* is French to the core. Indeed, little remains of the old heroes and heroines, villains, and saints, save their names and the thread of historic tradition. Racine's tragedies teem with anachronisms, but these anachronisms are precisely what quickens the Racinian characters and makes them national or racial. They are not restorations, but vivid adaptations.

Racine's tragedies and his *Plaideurs* are written wholly in Alexandrine verse. In *Athalie* and *Esther* other measures are employed in the choruses. His vocabulary is limited. There are very few allusions to visible nature, to hills, rivers, plants, animals, etc. The whole interest, in a word, is centred in man, and mostly in the aristocracy. The mob, the lowly folk, even middle-class people, are conspicuously absent. Racine is therefore the poet of the highborn. He has never appealed to the French nation as a whole, but rather to the most cultivated and fastidious classes, who find in him a precise and poetic interpretation of the loftier, more general sides of life.

Bibliography. Of many editions of Racine the best is by Paul Mesnard (10 vols., Paris, 1865–73). That by Girodet (3 vols., ib., 1801–05) is remarkable for its typography. That of Anatole France is also noteworthy (5 vols., ib., 1874). The first edition is dated 1675–76; the last revision by Racine, 1697. There is an English translation (metrical) by R. B. Boswell, in Bohn's Library (2 vols., London, 1889–91). *Andromaque* was adapted as *The Distressed Mother* by Ambrose Philips in 1712. *Phèdre* was acted in London in English in 1707. For Racine's life we have *Mémoires,* edited by his son Louis (q.v.) (Lausanne, 1747). Consult the popular biographies by E. A. E. M. Deschanel (Paris, 1884); Paul Monceaux, *Racine* (ib., 1892); also: Roy, *Racine: sa vie intime* (ib., 1871); Stendhal, *Racine et Shakespeare* (ib., 1882); Ferdinand Brunetière, in *Histoire et Littérature,* vol. ii (ib., 1884); Jules Lemaître, in *Impressions du théâtre,* vols. i, ii, iv (ib., 1888–90), containing useful criticism of Racine's dramatic art; Pierre Robert, *La poétique de Racine* (ib., 1890); Ferdinand Brunetière, *Les époques du théâtre français* (ib., 1892); Felix Deltour, *Les ennemis de Racine* (ib., 1892); De Grouchy, *Documents inédits rélatifs à Jean Racine* (ib., 1892); Delfour, *La Bible dans Racine* (ib., 1893); Paul Stapfer, *Racine and Victor Hugo* (4th ed., ib., 1894); J. H. Hallard, in *Gallica and Other Essays* (London, 1895); Gustave Larroumet, in *Les grands écrivains* (Paris, 1898); D. F. Canfield, *Corneille and Racine in England: Study of English Translations* (New York, 1904); Jules Lemaître, *Jean Racine* (18th ed., Paris, 1908); C. A. Sainte-Beuve, *Port Royal* (new ed., 7 vols., ib., 1908); Masson-Forestier, *Autour d'un Racine ignoré* (ib., 1911).

RACINE, Louis (1692–1763). A French writer, second son of Jean Racine. Strongly influenced by Jansenism, he wrote much religious poetry, not appreciated by his contemporaries. However, such verse as *La grâce* (1720) and *Religion* (1742) shows sincere piety. Racine also wrote many epistles and odes, such as *Ode sur l'harmonie* (1736). His *Mémoires* of his father (1747) are especially valuable for the insight they give into the great dramatist's literary activities. In 1755 he made a prose translation of *Paradise Lost.* His complete works, in eight volumes, were published in 1808.

RACK (Goth. *uf-rackjan,* OHG., Ger. *recken,* to stretch; connected with Lat. *regere,* to stretch, rule, Gk. *ὀρέγειν, oregein,* Lith. *ráizyti,* Skt. *arj,* to stretch). An instrument of torture, formerly used for extracting confessions from criminals and suspected persons. It consisted of a large oblong frame of wood, with four beams, slightly raised from the ground, on which the sufferer was stretched and bound. Cords were attached to his ankles and wrists and gradually strained by means of a lever and pulleys, or gears, till—unless the prisoner confessed and was released—dislocation of the limbs ensued. The rack was in use among the Romans in the first and second centuries, and many of the early Christians underwent its tortures. Coke mentions its introduction into the Tower of London by the fourth Duke of Exeter, constable of the Tower, in 1447, when it came to be called the Duke of Exeter's daughter; its use is mentioned by Hollinshed in 1647, and it became common in the time of Henry VIII as an implement of torture for prisoners confined in the Tower. The infliction of the punishment of the rack took place during the reign of the Tudor sovereigns by warrant of council or under the sign manual. In 1628 it was proposed in the Privy Council to put Felton, the murderer of the Duke of Buckingham, to the rack, in order that he might confess as to his accomplices, but the judges resisted the proceeding as contrary to the law of England. In various European countries the rack was frequently used both by the civil authorities in cases of traitors and conspirators and by members of the Inquisition to extort a recantation of heresy.

RACK. A liquor. See Arrack.

RACK'AROCK'. See Explosives.

RACKETS. See Racquets.

RACKET-TAIL. A name for certain humming birds (q.v.) two or more of whose tail feathers are greatly elongated, bare of webs towards their tips, and then suddenly broadly webbed, suggesting the shape of a tennis racket. Several species of extraordinary brilliance inhabit the Andean region, of which the species (*Steganura underwoodi*) illustrated on the Plate of Humming Birds is a characteristic example. The name puff-leg is sometimes given to these hummers on account of the mass of loose white feathers about their tarsal joints. Similar tail feathers occur in other species, as the magnificent *Loddigeria mirabilis* of northern Peru.

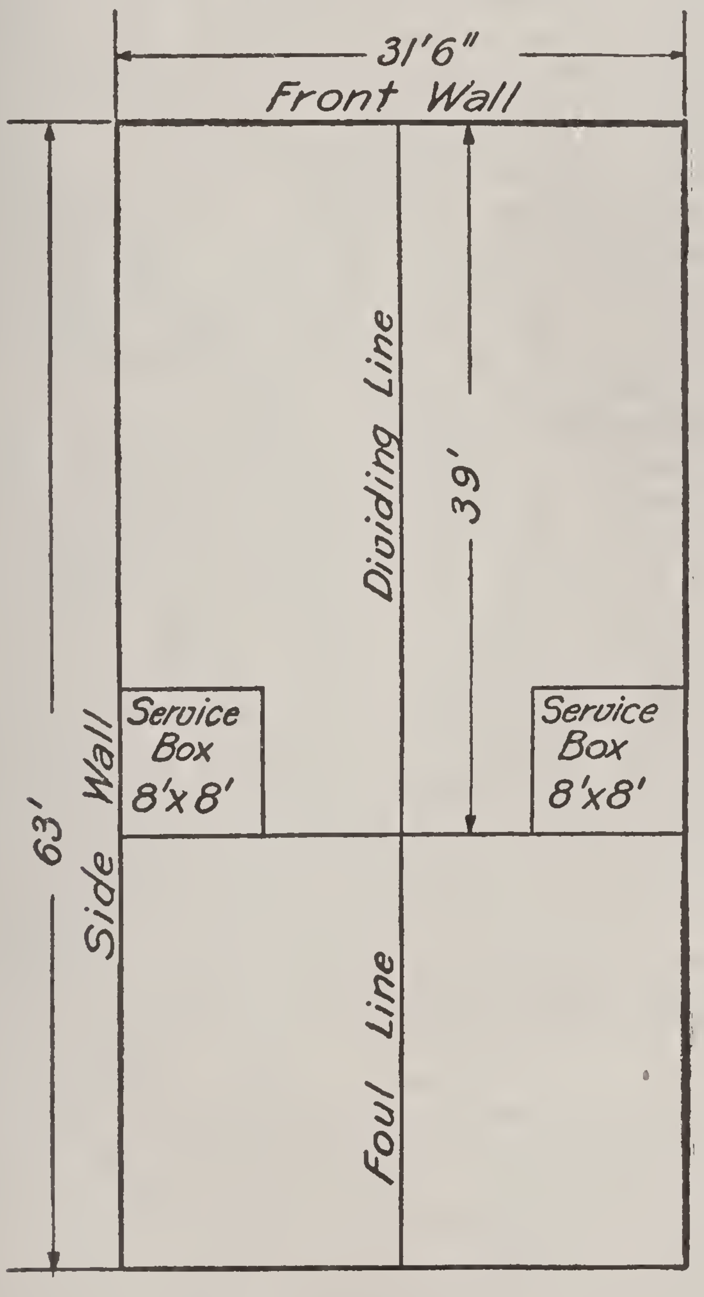
RACKHAM, răk'am, Arthur (1867–). An English illustrator and water-color painter, born in London. He studied at the Lambeth Art School, but was mainly self-taught. In the early nineties he began to contribute drawings to the *Pall Mall Budget,* the *Graphic,* and other periodicals, but soon found his true field as an illustrator of the fantastic. With sympathy and understanding Rackham interprets the American legend, the English fairy story, and the German folk tale. His technical ability and sense of beauty, combined with a rich and quaint imagination, give him a unique position among British artists. His favorite medium is a combination of pen line and tinting in color washes, but he excels equally in black and white and water color, his work being always delicate, graceful, and at the same time broad and finished. His illustrations include those for *Rip van Winkle* (1905); *Peter Pan* (1906); *Alice in Wonderland* (1907); *Ingoldsby Legends* (1907); *Midsummer Night's Dream* (1908); *Grimm's Fairy Tales* (1909); a wonderful series for Wagner's *Ring of the Nibelung* (1910–11); *Æsop's Fables* (1912); *Mother Goose* (1913); Dickens's *A Christmas Carol* (1915). He became a member of the Royal Water Color Society, where he frequently exhibited. There are drawings by him in the Tate Gallery and in the national collections at Barcelona, Vienna, and Melbourne. He received gold medals at Milan (1906) and Barcelona (1911) and a medal at Paris in 1912.

RACK RENT. A rent that is equivalent to the full net annual value of the real property out of which it issues, or approximately so. By statute in England to-day rack rent is defined to be "not less than two-thirds of the full net annual value of the lands out of which it arises." Rack rent in the ancient sense has probably never been exacted in the United States. See Rent.

RACOONDA. See Coypu.

RACO'VIAN CATECHISM. A catechism first printed at Rakow, or Racovia, Poland, in 1605 in Polish and in 1609 in Latin. It was based on the writings of Socinus (q.v.) and presented his doctrines. An English translation was published in London in 1818. Consult W. D. Curtis, *A History of Creeds and Confessions of Faith* (Edinburgh, 1911).

RAC'QUETS, or **RACK'ETS** (Fr. *raquette*, from OF. *rachete, rachette, rasquete, rasquette*, from Sp. *raqueta*, racquet, battledore, from Ar. *rāḥat*, palm of the hand). A modern legitimate descendant of the old game of tennis (q.v.). It is probably of British origin and arose about the beginning of the nineteenth century, being at that time played chiefly in the English debtors' prisons by men who were tennis players, but in their incarceration had to make shift with a less elaborate court. It began as an open-court game, the ball being batted against a single wall so as to rebound within a marked space upon the ground. Other walls were added as the game developed, and it is now mostly played within a closed court surrounded by four walls and covered with a high roof. The game in America is substantially the same as in Europe, excepting that the courts are somewhat slower and sometimes a trifle smaller and the balls slightly softer. The game is played by two or by four divided into pairs, on a covered court having an asphalted or stone-paved floor space 63 feet long by 31 feet 6 inches wide, surrounded by plain plastered walls about 40 feet high at one end and both sides. The other end wall is usually utilized as a gallery for onlookers. On the front wall, on one line, the service line is drawn across 8 or 10 feet from the floor. The play line, marking the limit for low balls after the serve has been delivered, is 2 feet, 2½ inches from the floor, and the space from this line to the floor is called the board. The floor is divided by lines into six spaces, two of which are called service boxes. At the start one player, called the hand in, stands in the service box and the other, the hand out, in one of the spaces. The hand in drops a ball and strikes it with a racket (like a long-handled tennis racket). If he serve from the left box the ball must strike first the front wall over the service line and rebound into the court on the right side marked off by the cross-court and half-court lines. These conditions are reversed if the service is from the right box. The server's opponent may return the ball to any part of the front wall above the service line. The server (hand in) scores when his opponent fails to return the ball to the front wall above the play line before it has bounded twice (except in case of a let), or when he knocks the ball out of court, or if he interferes with the ball. He loses his serve if the ball touches him before he sends it into the proper court, or if the ball strikes the board or out of the court, or if the ball strikes any part of the court before it strikes the front wall, or if he fail twice to strike properly the front wall, or if the ball he returns fails to strike the wall above the play line, or if he return the ball out of court, or if the ball strikes his body or his clothing. Fifteen points, or aces, constitute a game. Consult *Racquets, Court Tennis, Hand Tennis, Squash*, in Spalding's Athletic Handbooks, No. 50 R (New York, annually), and F. C. Tompkins, *Court Tennis, with Notes on Racquets and Squash-Rackets* (Philadelphia, 1909).



PLAN OF RACQUET COURT.

RADA, RODRIGO JIMÉNEZ DE. See JIMÉNEZ DE RADA, RODRIGO.

RADAUTZ, rä'douts. A town of Bukowina, Austria, 32 miles south of Czernowitz (Map: Austria, J 3). Its manufactures include machinery, paper, leather, and wagons. An Imperial stud with about 1500 horses is located here. Pop., 1911 (district), 80,974.

RADBER'TUS, PASCHASIUS. See PASCHASIUS RADBERTUS.

RAD'CLIFFE. A cotton-manufacturing and coal-mining town in Lancashire, England, on the Irwell, 2 miles southwest of Bury (Map: England, D 3). Pop., 1901, 25,368; 1911, 26,084.

RADCLIFFE, ANN (1764–1823). An English romancer, born in London, July 9, 1764. Her maiden name was Ward. At 23 she married William Radcliffe, afterward editor and proprietor of the *English Chronicle*. The group of romances by which she became famous comprise: *The Castles of Athlin and Dunbayne* (1789); *A Sicilian Romance* (1790); *The Romance of the Forest* (1791); *The Mysteries of Udolpho* (1794); *The Italian, or the Confessional of the Black Penitents* (1797). These were translated into French and Italian and two of them dramatized. After 1797 Mrs. Radcliffe lived in retirement, and there were false rumors that she had gone insane over the horrors conjured up in *Udolpho*. After her death, Feb. 7, 1823, appeared an historical romance, *Gaston de Blondeville* (1826). Of interest also is *A Journey through Holland and Germany* (1795). Mrs. Radcliffe's writings, with their mysteries, horrors, and tumultuous nature, were exceedingly popular in their day. Establishing as they did the vogue of the so-called Gothic romance introduced by Horace

Walpole, they assured her of a secure place in the Romantic movement. For *Udolpho* she received £500 and for *The Italian* £800—unprecedented sums before the advent of *Waverley.* Consult the brief memoir prefixed to *Gaston de Blondeville* (1826); Scott's introduction to her romances in Ballantyne's Novelists Library (London, 1824); H. A. Beers, *History of English Romanticism in the Eighteenth Century* (New York, 1899); and see Novel.

RADCLIFFE, or **RADCLYFFE**, James. See Derwentwater, third Earl of.

RADCLIFFE, John (1650–1714). An English physician, the founder of the Radcliffe Library at Oxford. He was born at Wakefield, Yorkshire, and was educated at University College, Oxford (M.A., 1672). In 1675 he began to practice medicine at Oxford. In less than two years his skill had made him famous, and in 1684 he removed to London, where he soon became the most popular physician of his time. In 1686 the Princess Anne of Denmark made him her physician, and after the Revolution he was consulted by the court. From 1690 to 1695 he sat in Parliament for Bramber. He died at Carshalton and was buried at Oxford in St. Mary's Church. He left £40,000 for the erection of a public library in Oxford, since known as the Radcliffe Library, which he also endowed. The Radcliffe Observatory and the Radcliffe Infirmary at Oxford were also erected and endowed through his gifts, and legacies went to St. Bartholomew's Hospital and to University College, London.

RADCLIFFE COLLEGE. An institution for the higher education of women at Cambridge, Mass., founded in 1879 as the Society for the Collegiate Instruction of Women. It was popularly known as the Harvard Annex until 1894, when by Act of the General Court of Massachusetts its name was changed to Radcliffe College in honor of Anne Radcliffe, the first woman to give a money endowment to Harvard. It had in 1914–15 a faculty of 136, all of whom were instructors in Harvard University, and 628 students. The requirements for admission and for the degrees of bachelor of arts, master of arts, and doctor of philosophy are identical with those of Harvard University. The institution had in 1915 a working library of 32,000 volumes, buildings and grounds valued at $900,000, and an income of $160,000, including annual receipts from tuition fees and income from endowment. Forty-two scholarships, each sufficient to meet the tuition fee of $200, are awarded annually. The president in 1915 was Le Baron R. Briggs, LL.D. Consult H. P. Dowst, *Radcliffe College* (Boston, 1913).

RADDE, råd′de, Gustav Ferdinand Richard (1831–1903). A German-Russian naturalist and traveler, born at Danzig. After accompanying the Russian expedition to southeast Siberia (1855–60) and going with Von Baer on his scientific trip through southern Russia (1862), he founded at Tiflis the Museum of the Caucasus, of which he became director. In this capacity he traveled through upper Armenia (1871), northern Persia (1879), Daghestan (1885, 1894), Khorassan (1886), along the eastern coast of the Black Sea (1890), and accompanied the Grand Duke Sergei Mikhailovitch on his travels in Asia (1891) and the Grand Duke George Alexandrovitch on two trips to the Mediterranean (1895–97). His works deal with his experiences in different parts of the world.

RADE, rä′d*e*, Paul Martin (1857–). A German Lutheran theologian, born at Rennersdorf, Silesia. After studying at Leipzig he was pastor at Schönback-bei-Löbau (1882–92) and at St. Paul's, Frankfort (1892–99), and served as privatdocent (1900–04) and thereafter as associate professor of systematic theology at Marburg. In 1886 he founded and thenceforth edited the *Christliche Welt* and was associate editor of *Zeitschrift für Theologie und Kirche.* His writings include: *Damasus, Bischof von Rom* (1882); *Dr. Martin Luthers Leben, Taten, und Meinungen* (3 vols., 1884–87); *Die Konfessionen und die soziale Frage* (1891); *Der rechte evangelische Glaube* (1892); *Zu Christus hin* (1897); *Religion und Moral* (1898); *Die Wahrheit der christenlichen Religion* (1899); *Unbewusstes Christentum* (1905); *Das religiöse Wunder und anderes* (1909); *Die Stellung des Christentums zum Geschlechtsleben* (1910); *Jatho und Harnack* (1911); *Mehr Idealismus in der Politik* (1911); *Unsere Pflicht zur Politik* (1913).

RADEBERG, rä′d*e*-bĕrK. A town in the Kingdom of Saxony, Germany, situated about 10 miles northeast of Dresden (Map: Germany, F 3). It has glass works, paper mills, and manufactures of nails, safes, furniture, etc. Pop., 1900, 12,918; 1910, 13,413.

RADECKE, rä′dĕ-k*e*, Robert (1830–1911). A German composer. He was born in Dittmannsdorf in Silesia and received his musical training in the Conservatory of Leipzig. In 1853 he became musical director of the Court Theatre of that city. He removed to Berlin soon after, played second violin in Laub's quartet, and gave many successful concerts. He was royal kapellmeister from 1871 to 1887 and from 1892 to 1907 director of the Royal Institute for Church Music. An artist of ability on pianoforte, organ, and violin, Radecke is best known for his compositions, which include two orchestral overtures, *König Johann* and *Am Strande*, the operetta *Die Mönkguter* (1874), and, above all, for his many songs.

RAD′EGUN′DIS, Saint (519–87). The patron saint of Poitiers in France. She was the daughter of Berthar, a prince of Thuringia. Having been carried as a prisoner to the country of the Franks in the twelfth year of her age by Clotaire I, King of the district whose capital was Soissons, she was educated in the Christian religion, and when she reached a mature age was induced, reluctantly, to become the wife of Clotaire. Her own wish having been to become a nun, her married life was in great measure given up to works of charity and religion. In 544, her husband having murdered her brother, she fled from the palace and retired to the monastery at Noyon. Afterward she founded a monastery at Poitiers, in which she lived merely as a sister. Her feast day is August 13. Consult Otto Bardenhewer, *Patrology*, English translation by T. J. Shahan (St. Louis, 1908).

RADETZKY, rȧ-dĕts′kē, Joseph Wenzel, Count (1766–1858). An Austrian field marshal, born in Trzebnitz, Bohemia. In 1784 he became a cadet in an Hungarian cavalry regiment. His first campaign was against the Turks in 1788–89. He fought in the wars of the French Revolution and the Napoleonic wars, attaining the rank of major general in 1805 and lieutenant field marshal in 1809. In 1813–14 and 1815 he was chief of staff of Prince Schwarzenberg. In 1831 he commanded in Italy and in 1836 he became field marshal. On the outbreak of the insurrection in Lombardy in 1848 Radetzky was driven from Milan after five days of desperate fighting and fell back on Verona. His position was for a time precarious, but having received reënforcements he was enabled to assume the offensive and inflicted a crushing defeat on the Sardinian King Charles Albert at Custozza, July 25, 1848. A six months' armistice was agreed to, and war was not resumed by the Piedmontese till March, 1849. Radetzky was this time better prepared, and at once invaded Piedmont. He totally routed the enemy at Novara, March 23, 1849. Peace was concluded with Sardinia, and Radetzky besieged Venice, which surrendered after a long siege (August 23). He was then appointed Governor-General of Lombardy and Venetia, and ruled until February, 1857. There are biographies of Radetzky by Krones (Vienna, 1891) and Schönhals (Stuttgart, 1858). Consult also Kunz, *Die Feldzüge des Feldmarschalls Radetzky in Oberitalien* (Berlin, 1890).

RADFORD. A city in Montgomery Co., Va., 45 miles west by south of Roanoke, on the New River and on the Norfolk and Western Railway (Map: Virginia, D 4). Chiefly a manufacturing place, Radford has iron furnaces, veneering, cast-iron pipe, and sand-lime-brick works, and flour mills. There is an extensive fair ground where a yearly fair is held. Radford was first settled in 1756. Pop., 1900, 3344; 1910, 4202.

RADFORD, WILLIAM (1808–90). An American naval officer, born at Fincastle, Botetourt Co., Va. He entered the navy in 1825 and rose through successive grades to the rank of rear admiral, which he attained in 1866. He distinguished himself at Mazatlan in 1847 during the Mexican War, and commanded the *Cumberland* in 1861, but was on court-martial duty at Old Point Comfort when the vessel was sunk by the *Merrimac.* He served in both attacks on Fort Fisher in 1864–65, was in command of the *New Ironsides* under Admiral Porter, and in 1869–70 commanded the European squadron.

RA′DIAN. See CIRCLE.

RA′DIANT STAR, ORDER OF THE. An order of Zanzibar, founded by Sultan Bargash ben Said in 1875. It has two classes, of which the first is given only to sovereigns, the second forming an order of merit with four divisions. The decoration is a red cross with five arms edged with white on a green wreath. The circular medallion bears the Sultan's name. The cross is suspended by a wreath from a red ribbon edged with white.

RA′DIA′TA (Lat. nom. pl., having rays). The lowest of Cuvier's four great divisions of the animal kingdom. It derived its name from the organs of sense and motion being disposed as rays around a centre and included (1) the Echinodermata, (2) the Entozoa (or intestinal worms), (3) the Acalephæ (or sea nettles), (4) the Polypi, and (5) the Infusoria. See CLASSIFICATION OF ANIMALS.

RA′DIA′TION (Lat. *radiatio*, a shining, from *radiare*, to shine, from *radius*, ray). The name given to the energy emitted by material bodies and also by electric oscillations. In accordance with the classical theory of physics this energy is in the form of waves in the ether (q.v.). Since wave motion involves both the vibration and the displacement of the medium carrying the waves, there is always both kinetic and potential energy associated with the advance of a train of waves.

Waves in the ether are produced in many ways. Thus every portion of matter is emitting these waves; e.g., when we see a source of light, like a candle flame, the sensation is due to ether waves which are sent out by the white-hot particles of carbon in the flame; when we are exposed to sunshine and feel warm, the sensation is due to ether waves sent out from the white-hot sun; etc. Again, the waves with which we are familiar in wireless telegraphy (q.v.) are ether waves. They are produced by electrical oscillations over the surface of charged conductors. The ether waves which produce the sensations of light and warmth are emitted in consequence of the vibrations of the electrons in the atoms which make up the matter.

If the waves are short they may produce vibrations of the electrons in the matter in accordance with the principle of resonance. Thus, if the waves of a certain period enter a material body whose electrons have a natural period the same as this, they will be set in vibration by the waves and will therefore absorb them, gaining their energy. When this absorption takes place further changes occur, determined by the nature of the matter. Thus, certain ether waves falling upon the eye produce changes which result in vision; again, if certain ether waves are absorbed by photographic films, chemical action goes on which may be detected later; but in general the energy gained by the matter is diffused among the molecules themselves and is manifested by the appearance of heat effects. To measure the energy of the radiation the absorbing instrument should absorb all the energy, and the corresponding change produced should be one which is in direct proportion to the energy added to the body. It is well known that polished bodies like bright metallic surfaces absorb very little energy, while blackened ones absorb nearly all of it, provided the waves are not too long. Consequently radiation as produced by material bodies is detected and measured by instruments which are sensitive to heat changes and whose surfaces are covered with a layer of lampblack, copper oxide, or platinum black. (Among such instruments may be mentioned bolometers, radiomicrometers, radiometers, etc.)

By using a prism, grating, or interferometer to disperse the radiation into trains of definite wave length, many interesting facts have been established. All material bodies in the universe, so far as we know, are producing waves in the ether. Solid and liquid bodies emit what is called a continuous spectrum, i.e., one made up of waves of all wave lengths between certain limits; gases on the other hand emit isolated trains of waves of definite wave lengths. Radiation from gases is as a rule brought about by some electrical discharge, and it is treated more fully under SPECTRUM ANALYSIS. There are many cases of the emission of radiation by solids and liquids which involve chemical changes in the solid. This phenomenon is called *luminescence.* The most interesting case, however, of radiation from solids is that in which there are not any molecular changes but the emission is conditioned by the temperature of the body.

Pure ether waves have a velocity 3×10^{10} centimeters per second, i.e., about 187,000 miles per second. Those waves which affect our sense of sight lie between wave lengths 0.00007 centimeter and 0.000038 centimeter. The longest of these produce the sensation red, those slightly shorter, orange, etc., through yellow, green, blue to violet, which is caused by the shortest of the visible waves. Photographic action has been produced by waves as long as 0.0001 centimeter and also by all the waves shorter than this so far observed. Waves produced by ordinary matter, such as hot and cold bodies, luminous gases, etc., have wave lengths extending over a wide range. The longest so far observed has a wave length 0.014 centimeter and the shortest 0.000009 centimeter. It was shown in 1913 by Laue, Bragg, and Moseley that X rays (q.v.) might be analyzed by a crystal, acting as a space grating, into trains of extremely short waves ranging in length from 0.00000001 centimeter to 0.000000055 centimeter depending upon the metal which serves as the anticathode in the X-ray tube. As noted before, electrical oscillations will also produce waves in the ether; those in use in wireless telegraphy have a wave length of many thousand feet or miles, but by using very small electrical conductors electrical oscillations upon them have produced waves whose lengths were as small as 0.2 centimeter.

The most interesting work both by theory and by experiment has been done in connection with the temperature radiation of solids. Further, since this radiation is due to vibrations of the electrons in the atoms and since absorption is due to resonance on the part of the electrons in the matter, it is obvious that there must be some connection between the radiation emitted by a body and its absorptive properties. By coating a body with lampblack or finely divided platinum it becomes a very good absorber, practically all the incident radiation being taken up by the body and spent in producing heat effects. If in a hollow body made up of any material, e.g., iron or copper, there is made a small opening so that radiation from without can penetrate to the interior, it is evident that any such incident radiation will, after a series of internal reflections to and fro inside the hollow body, be totally absorbed, with the exception of a minute amount which may escape through the opening. Such a body makes an almost perfect black body. It can be shown by theory that, if such a body be maintained at a constant and uniform temperature, the radiation inside it is definitely characteristic of the temperature alone and is independent of the nature of the matter which makes up the hollow inclosure. If this radiation were to be dispersed by a prism or grating into trains of waves of varying wave length, theory shows us that there is a definite amount of energy associated with each train of waves of a definite wave length, i.e., if the energy carried by those waves whose wave lengths lie between λ and $\lambda + d\lambda$ is measured, it is characteristic of the temperature of the inclosure. This means that not only the total energy in the inclosure is characteristic of the temperature but also the partial energy carried by trains of different wave length.

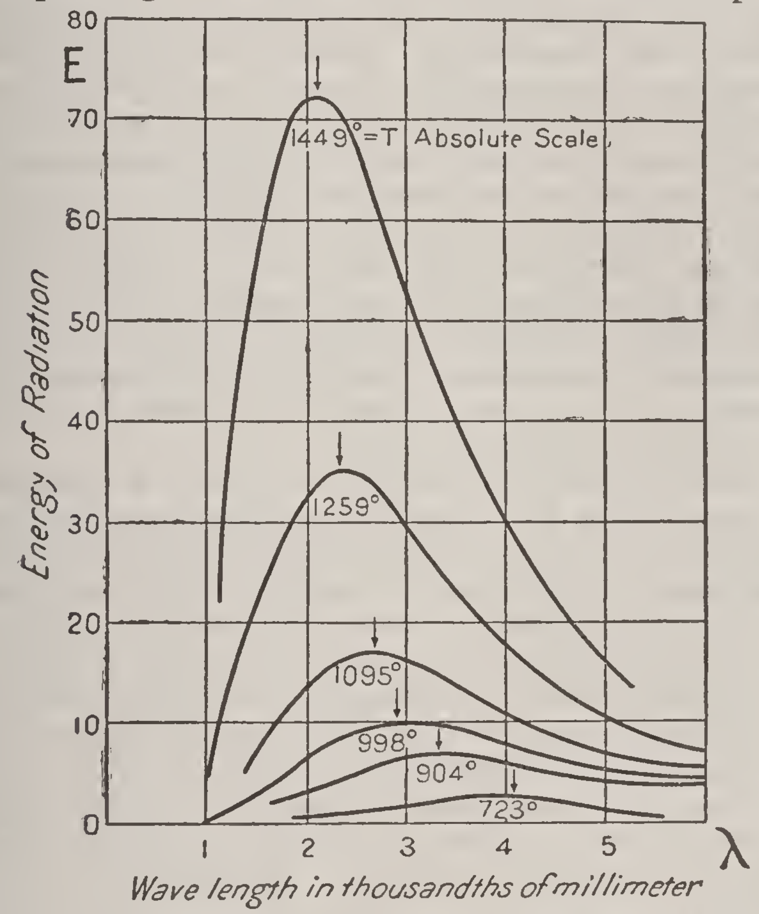
When one considers bodies other than a black body it is possible to state a certain general law which bears the name of Balfour Stewart or of Kirchhoff. Before stating the law it is convenient to define two terms. The absorptive power of a body for a train of waves of a definite wave length is defined as being the fraction of the incident radiation of that wave length which the body absorbs; thus, the absorptive power of a black body is 1 and that of all other bodies is less than this. The emissive power of a body for a train of waves of a definite wave length is defined as the ratio of the energy radiated by 1 square centimeter of the surface of the body in the form of waves of the specified wave length to that emitted by 1 square centimeter of a black body under the same conditions of temperature and of the same wave length. The statement of the law connecting radiation and absorption is, then, that the emissive power of any body is identical with its absorptive power at the same temperature. Thus, let E be the energy emitted by 1 square centimeter of a black body at a given temperature in the form of waves of a definite wave length; let e be the corresponding energy emitted by 1 square centimeter of any body at the same temperature; let a be the absorptive power of this body for these waves at this temperature. The law states that

$$\frac{e}{E} = a.$$

This may also be written $\frac{e}{a} = E$; and since E is, as said above, conditioned only by the temperature of a black body, it follows that $\frac{e}{a}$ is a function of the temperature, the same for all bodies. This exact mathematical relation indicates that if a body has the power to absorb to a marked extent, it will also be a good radiator. The law gives an exact relation which holds for a definite temperature, but the general relation holds with more or less truth even when we consider the radiating power and the absorbing power of the body at different temperatures. Thus, a polished silver surface, which is a poor absorber, is also a poor radiator. A transparent body is also a poor radiator. Glass, which is transparent at low temperatures, becomes more or less opaque at high temperatures, and under these conditions is able to emit radiation. Tourmaline has the property of absorbing a certain type of polarized light (see LIGHT); when a piece of this crystal is raised to a temperature sufficiently high, it is found to emit this same type of light.

Among the conclusions which may be drawn from Kirchhoff's law, $e = aE$, in which E is a constant, is that e has its greatest value when a has its greatest, i.e., when it equals 1. In this case e is the same as E; i.e., for the particular train of waves under consideration the emission of the body is the same as that of a black body at the same temperature, provided it absorbs completely such waves when they are incident upon it. In no case can the body emit more intensely than a black body at the same temperature. When a body of any kind is put in a flame whose temperature is kept constant, the body does not necessarily come to the temperature of the flame; it is receiving energy from the flame, but is losing energy by radiation, and so its own temperature is conditioned by the balance between its gain and its loss of energy. Its emission is governed by Kirchhoff's law. In a Welsbach mantle, which consists of a framework of thorium in which is a small quantity of cerium, Rubens has shown that the presence of the latter makes the mantle an excellent absorber of the shorter (i.e., blue) waves if the temperature is high, but it absorbs only slightly the waves longer than the red.

It is seen that the fundamental quantity in all radiation problems is the emission of a black body. It is necessary to know, not alone the total emission of energy at any one temperature, but also the partial radiation, i.e., the amount of energy associated with waves whose wave lengths lie between λ and $\lambda + d\lambda$. The total emission can be deduced from thermodynamical considerations, as was done by Boltzmann. Bartoli had previously shown that in a hollow inclosure, where of course radiation is passing to and fro, this radiation produces a mechanical pressure upon the walls equal in amount to the energy per unit volume, provided the radiation is normal to the absorbing surface. (See RADIATION PRESSURE.) (In the general case, when the radiation is not normal, the pressure is one-third of this.) The law deduced by Boltzmann was that the total radiation per square centimeter of a black body at a temperature T on Thomson's absolute scale (see THERMODYNAMICS) is proportional to the fourth power of the temperature, i.e., total $E = aT^4$, where a is a constant. This same law had been deduced before empirically by Stefan as the best mathematical expression of the experimental results of many observers on the radiation from ordinary bodies, although, of course, the value of the constant in his equation was less than in Boltzmann's. Stefan's law is by no means true except for a black body, being only an approximation for other bodies. The true law for a black body is referred to as the Stefan-Boltzmann law. It can evidently serve as a means of determining the temperature of a body which approximates a black body, e.g., a furnace or oven, provided the value of the constant is known. (See THERMOMETRY.) The accepted value is 1.71×10^{-5} in ergs and degrees Centigrade, or 0.408×10^{-12} in calories, although there is some uncertainty as to its accuracy.



BLACK BODY RADIATION. (After Lummer and Pringsheim.)

The partial radiation from a black body has been studied by many observers, notably by Lummer and Pringsheim. Their results may best be shown by drawing curves, with energy as ordinates and wave lengths as abscissæ, each curve applying to any one temperature.

Several facts are obvious, among them that the curves for higher temperatures are entirely outside those for lower; i.e., as the temperature is raised the partial radiation for any one wave length is increased; that the maximum ordinate of any curve shifts towards the shorter wave lengths as the temperature is raised; this explains why the temperature of a body must be high before it becomes self-luminous. A most important problem is to deduce a mathematical formula which will apply to these curves, i.e., to be able to express the partial energy E as a function λ and T, so that when the mathematical curves are plotted they will agree with the experimental ones. Planck succeeded in doing this on theoretical grounds, making certain assumptions to which reference will be made later. His formula is

$$E = \frac{c\lambda^{-5}}{e^{\frac{b}{\lambda T}} - 1}$$

where c and b are constants, e is the base of the natural system of logarithms, and $E\lambda$ is the energy associated with waves whose wave-lengths lie between λ and $\lambda + d\lambda$. This law of Planck's leads at once to the Stefan-Boltzmann law. Further, if for any one temperature T the wave length which corresponds to the maximum amount of energy is called λ_m and if the value of E for this value of λ is called E_m, the following two formulæ may be deduced from Planck's, viz.:

$$\lambda_m T = \text{a constant for all temperatures,}$$

$$\frac{E_m}{T^5} = \text{a constant for all temperatures.}$$

(These two laws had been deduced previously, and are verified by experiment. They also can serve as means of determining the temperatures of black bodies.)

If in practice only the shorter waves are observed, a simpler formula than that of Planck's may be used. It is obtained by making λ very small in his formula. It then becomes

$$E = \frac{c}{\lambda^5} e^{-\frac{b}{\lambda T}}.$$

This law had been proposed previously by Wien and is called by his name. The accepted values of the constants are: $c = 1.26 \times 10^{27}$; $b = 145 \times 10^6$; if energy is measured in ergs, temperature in degrees centigrade, and wave lengths in Angström units (i.e., 1 such unit $= 10^{-8}$ centimeter) $e = 2.718$. It is used as a basis of determining temperature by certain instruments. With these light of a definite color is used, i.e., λ is constant. Under these conditions

$$E = Ae^{-\frac{B}{T}},$$

where A and B are constants. Hence

$$\log E = \log A - \frac{B}{T}.$$

Thus, if curves are plotted having log E as ordinates and $\frac{1}{T}$ as abscissæ, we obtain a series of straight lines for different values of λ, which are called isochromatics. For any definite wave length there will be a definite isochromatic, and if the energy E is known, it will correspond to a definite point of this line, i.e., it will fix the value of T. This is the principle made use of in applying the above formula as a means of thermometry.

As noted above Planck deduced his radiation formula from theoretical considerations and in the course of this deduction made certain assumptions which are of the utmost importance. Since his original investigation he has modified these, but has kept the one of greatest interest. This is equivalent to stating that radiation of energy from any body is a discontinuous process; each elementary radiator emits energy in equal amounts called quanta, the value of the quantum for any radiator being hN, where h is a universal constant and N is the natural frequency of the vibrations of the radiator. This theory of Planck's is supported by many experimental facts from widely different fields of science, e.g., photo-electric action, specific heats at low temperatures, etc. What is perhaps the most important conclusion to be drawn from it is one to which attention has been called by Jeans, viz., if it is true, then the laws of nature—of mechanics and electricity—cannot be expressed in the form of differential equations, because they imply continuous processes.

A matter of fundamental importance is the nature of the disturbance in the ether (assuming its existence), which constitutes radiation: is it a train of periodic waves or is it a series of sudden more or less irregular pulses? Such a motion as an infinite train of waves is of course impossible, and our knowledge of the mechanism of emission of radiation, viz., the acceleration of electrons, makes it certain that the radiation must be considered as composed of pulses. Of course these may be analyzed by Fourier's theorem into trains of waves, and these can then be discussed separately. The phenomena of interference, diffraction, dispersion, etc., are all discussed on the wave theory of radiation, but it has been shown by Gouy, Schuster, and others that gratings and prisms will impress a periodicity upon pulses, even when in the latter there is no periodicity originally. Within the years 1910–14 there were several most important investigations upon the nature of the pulses emitted by material bodies so that they may give rise to the laws of radiation (e.g., Stefan-Boltzmann law) and the ordinary phenomena of light. The passage of pulses through prisms has been discussed specially by Houstoun and by Green (*Proceedings of the Royal Society of London*, 1913, 1914). For many years a sharp distinction was made between the phenomena of light and those of X rays, it being said that the former were due to periodic wave trains, the latter to pulses. This is now known not to be a true difference. All radiation consists of pulses, but in some there are periodicities owing to the nature of the vibrations of the radiators.

Bibliography. Schuster, *Optics* (London, 1909); Wien, "Theorie der Strahlung," in *Encyclopädie der mathematischen Wissenschaften*, vol. v (3d ed., Leipzig, 1909); R. W. Wood, *Physical Optics* (New York, 1911); Planck, *The Theory of Heat Radiation*, English translation by Martin Masius (Philadelphia, 1914); Paul Langevin, *La théorie du rayonnement et les quanta* (Paris, 1912).

RADIATION OF HEAT. See HEAT.

RADIATION PRESSURE. It was shown by Maxwell in 1873 on theoretical grounds that a beam of electromagnetic radiation, e.g., light, incident on an absorbing or reflecting surface exerts a mechanical pressure on the surface and that the pressure per unit area normal to the beam is equal to the energy per unit volume in the space next the surface. Bartoli arrived at the same result in 1876 from thermodynamic arguments. A number of physicists tried to verify this experimentally by suspending on a torsion fibre a light arm carrying a vane, in a vessel exhausted of air, and sending a beam of light against the vane. Deflections of the vane were easily obtained, but they were due mainly to the action of the remaining gas molecules (see RADIOMETER), and it was not easy to separate the effect of light pressure from this gas action. Finally, in 1901, Lebedew, by having the vacuum around his suspended vane so good that the gas action was very small, was enabled to detect and measure the pressure of a beam of light on the vane. Nichols and Hull were at work on the problem at the same time and were able to make more exact measurements, which confirm very exactly the Maxwell-Bartoli theory. In their experiments the vane was surrounded by air at such a pressure that two opposing actions of the gas neutralized each other.

The fact that radiation produces a pressure is equivalent to saying that it has momentum; and it follows at once that a body emitting radiation experiences a recoil. (When a bullet is expelled from a rifle the latter suffers a recoil, and when the bullet strikes a target the latter receives momentum from the former.) This momentum of radiation must be taken into account in Newton's laws of motion, but under ordinary circumstances—that is, with portions of matter of ordinary size—it is extremely small compared with the momentum of the matter.

The recognition of the existence of this radiation pressure has aroused much interesting astronomical and cosmical speculation. For example, it is probable that the observed action of comets' tails in swinging farther away from the sun than their heads, therefore out of their proper orbits on the gravitation theory simply, is due to the pressure of the sun's radiation on the small particles that compose the tails. The force of radiation pressure on a particle that is not small in comparison with the wave length of the radiation depends on the surface exposed, while the gravitational force is proportional to the volume; so as the ratio of surface to volume becomes greater as the size of the particles decreases, it is evident that the repellent force exerted by the radiation from the sun on small particles will become comparable with the attracting force of gravitation. Kepler, in the days of the corpuscular theory of light, proposed much the same theory to account for the strange behavior of comets' tails. Consult Nichols and Hull, *Physical Review* (New York, 1901), and Lebedew, *Annalen der Physik* (Halle, 1901). On application to cometary theory, consult Nichols and Hull, *Physical Review*

(1903), also Poynting, Royal Philosophical Society, *Transactions* (London, 1903).

RA'DIATOR. See HEATING AND VENTILATION.

RAD'ICAL. See RADICLE.

RADICAL AXIS. See CIRCLE.

RADICAL EMPIRICISM. See EMPIRICISM.

RAD'ICALISM (from *radical*, from Lat. *radicalis*, relating to a root, radical, from *radix*, root; connected with Gk. *ῥάδιξ*, *rhadix*, root, *ῥάδαμνος*, *rhadamnos*, branch, Goth. *waúrts*, root, OHG. *wurz*, Ger. *Wurz*, AS. *wyrt*, Eng. *wort*, weed). In modern history generally, the temper of mind which is most opposed to the conservative and aims at constant and progressive reform of political institutions. The word was first used of a political party in England about 1819, though a Radical party, marked off by clear distinctions from the Whigs, may be said to have originated in 1769 with the first concerted movement to reform and control Parliament by pressure without. Oddly enough the efforts of the first Radicals were directed, not against the crown or the House of Lords, but against the House of Commons. Radicalism in its origin was a middle-class movement; its active men were a limited class of voters who conceived that their rights were being infringed. Their first popular leader was Wilkes.

A second period extends from 1789 to 1831. The mighty influence of the French Revolution brought up a new class of Jacobinical Radicals. Under Thomas Paine and Godwin significant changes took place in their attitude. The crown and the House of Lords were attacked, complaints of oppressive taxation were heard, and the leaders of the school were most of them men who rejected religious creeds. The first quarter of the nineteenth century was a discouraging time for the Radicals, but they were not disheartened. This period witnessed the rise of the most profound and systematic philosophy of Radicalism that had yet been formulated. The scientific or philosophical Radicals now came forward, with Bentham and James Mill, with Ricardo and Grote and Joseph Hume. They gained a powerful organ when in 1824 they founded the *Westminster Review*. But there were also practical reformers, and the party was beginning to be recognized as having a definite existence. The working classes now began to take a greater part in the movement, and the first hints of modern Socialism were given by Spence and Owen.

The third period opens with the definite agitation for reform of parliamentary representation, which is part of general English history. While the Radicals lent their support to the movement for the passage of the Reform Bill, they regarded its results with disappointment and tended to become more and more sharply dissociated from the Whigs who had passed it. The hope of further enfranchisement of the people seemed slight, and the feeling of despair thus engendered gave rise to one of the most important phases in the history of English Radicalism, the Chartist movement. (See CHARTISM.) The Anti-Corn Law agitation, though the work of Radicals, especially of their two brilliant leaders, Cobden and Bright, was not an essential part of their campaign. Yet the Manchester school of politicians may be called the dominant type of Radicals from say 1840 to 1885, the connecting link between those of the beginning and the end of the century. Under the strong leadership of Chamberlain the Radicals succeeded in becoming the controlling force in the Liberal party.

On the Continent there is a strong tide of Radicalism. France has had a strong Radical party, under one name or another, ever since the outbreak of the Revolution. Its tenets are those of the party wherever it is found—the widest possible liberty for the individual. In addition the French Radicals have been the most persistent opponents of monarchy, and to their efforts the success of the revolutions of 1830 and 1848 may be attributed. To-day they are a strong party. In Germany the rise of the Radicals is of a comparatively recent date. The Socialists, both in Germany and France, must be considered as closely allied to the Radicals. Consult: *The Radical Programme* (London, 1885); A. L. Lowell, *Governments and Parties in Continental Europe* (Boston, 1896; abridged and revised ed. under title *Governments of France, Italy, and Germany*, Cambridge, Mass., 1914); Kent, *The English Radicals* (London, 1899); W. P. Hall, *British Radicalism, 1791–1797* (New York, 1912). See POLITICAL PARTIES.

RAD'ICLE, or **RAD'ICAL,** IN CHEMISTRY. See CARBON COMPOUNDS.

RA'DIOACTIV'ITY. The name given to the property possessed by uranium, thorium, and other similar bodies of emitting certain radiations spontaneously. Immediately after the discovery of X rays by Professor Röntgen in 1895 many physicists began investigations in order to see whether phosphorescent bodies in general would not emit rays of the same character. Among these was Prof. H. Becquerel, of Paris. In the first months of 1896 he made the great discovery that the salts of uranium emitted spontaneously certain radiations which would affect a photographic plate. He also found that these radiations would, like X rays, discharge electrified bodies, produce phosphorescence, and traverse many bodies which were opaque to ordinary light. The name Becquerel rays was given to these radiations. They were investigated immediately with the greatest care by many others, particularly by Ernest Rutherford, who was then a student in the laboratory of J. J. Thomson, Cambridge, England; and their properties will be described below. In the search for other substances which would emit radiations similar to those described above, it was discovered, almost simultaneously by Professor Schmidt and by Madame Curie, of Paris, in the year 1898, that the salts of thorium emit rays similar to those of uranium. M. and Mme. Curie began a prolonged investigation of all metals and metaloids, the rare earths, and a great number of rocks and minerals, in the hope of discovering other radioactive bodies, and were rewarded by discovering that pitchblende, which is a mineral containing the oxide of uranium and other substances, was much more active than pure metallic uranium. By a series of chemical separations they were able to isolate two substances, radium and polonium, which were most intensely radioactive, in some cases several thousand times more so than uranium. The discovery of these substances was made in 1898, and in 1899 another radioactive substance was discovered by M. Debierne which he called actinium and which accompanies certain bodies of the iron group contained in pitchblende.

The radiations from the radioactive substances produce effects which may be grouped under various heads—chemical, fluorescent, physiological, and electrical. Among the chemical actions it may be sufficient to mention the photographic action of the rays and their power to color glass and porcelain and in certain cases to produce ozone. The action of the rays on the skin is to produce a burn similar in some ways to that produced by the X rays. The radiations are able to destroy the germinating power of seeds. They have been applied to the treatment of cancer and lupus with good results in some cases. It has not been established definitely which type of radiation from radium has the beneficial action, but it is much the same as that of the X rays. See RADIUM, *In Medicine.*

Under the action of these radiations many substances emit light by fluorescence, among which may be mentioned especially platinobarium cyanide, the mineral willemite, zinc sulphide (Sidot blende), and the diamond. Even the skin and other parts of the body show a faint fluorescence under strong radiations, so that the sensation of light felt when radium is brought near the closed eye is probably to be accounted for by the fluorescence of some part of the eyeball. The radium salts continually emit light, owing to the fluorescence of the radium salt itself, or impurities therein, under it's own radiations, though it is an interesting fact that the purest radium salts do not shine so brightly as those which contain some impurity. It is an electrical effect, viz., the ionizing of a gas by the radiation (see ELECTRICITY, *Discharge through Gases*), that has been made most use of as a measure of the intensity of the radiations. The radiations break down some of the gas molecules into positive and negative ions, which remain in the gas for a short while before recombining. If now an electric potential difference is maintained between two electrodes in this ionized gas, a current will flow between them, and under proper conditions this current may be taken as a measure of the amount of radiation sent into the gas. A simple apparatus that is much used is a vessel containing strips of gold leaf arranged as in the ordinary gold-leaf electroscope and charged. If now the radiations are allowed to pass into the vessel, the air inside is ionized and the gold leaves lose their charge, the rate at which the leaves come together serving as an indication of the amount of radiation entering the vessel.

To discuss more fully the properties of the radiations it is necessary to distinguish between the three important types. All these radiations have the property of passing, with more or less loss by absorption, through opaque substances, but it was soon discovered that there were differences in this power which could only be explained by assuming that the radiations are complex in their nature, being made up of two groups, one very easily absorbed, the other extremely penetrating. The attempt was made to see whether either of these groups of radiations could be reflected, refracted, diffracted, or polarized, but it was found that they possessed none of these properties. It was discovered, however, that although in this last respect the radiations were similar to X rays, they differed from them in being deviated by a magnetic field. This proves that these radiations from radioactive bodies are not disturbances in the ether similar to X rays or light, but are electrified particles of matter moving at a rapid rate. It was discovered by several observers that the penetrating rays were easily deflected by a magnetic field, and in such a direction as to prove that they were carriers of negative electrical charges. It has been shown that an electrically charged body, if in rapid motion, is equivalent to an electric current, and since an electric current, if free to move in a magnetic field, is acted upon mechanically by the field, therefore an electrified particle in motion will have the direction of its path changed if subjected to a strong magnetic field, and the direction of the deflection will depend upon whether the particle is charged positively or negatively. Such a moving particle will also have the direction of its motion changed if it is made to pass through a strong transverse electrostatic field, and from the mathematical relation existing between the quantities involved the magnetic and electric deflections are the data necessary for the determination of the velocity and ratio of the charge to the mass for a particle.

The penetrating radiations, easily deflectable by a magnetic field, are called the β rays. The β particle is a negative charge, has a mass about $\frac{1}{1800}$ that of the hydrogen atom, and moves with high velocity. In other words, it is an electron, the natural unit of negative electricity. (See ELECTRON.) The β particles, even from the same radioactive substance, vary in velocity, ranging from a velocity too low to produce ionization to a speed 0.9995 that of light, the penetration depending on the velocity.

The law of absorption for homogeneous β rays is like that for ordinary light: if a screen of certain thickness absorbs half the radiation, the addition of a second screen of the same thickness will absorb half of what is left, and so on. The β rays from uranium are half absorbed in passing through 0.05 centimeter of aluminium, and for different materials the absorption is nearly proportional to the density of the material. Radiographs obtained by using β rays are less distinct than when X rays are used, since with X rays the variation in absorption is generally much greater than the variation in density of the objects whose shadows are obtained on the plate.

The fact that the β particles are negatively charged has also been shown by arranging for them to impinge on an insulated metal screen surrounded by a vacuum, in which case the screen receives a negative charge, as may be proved by having it connected to a suitable electroscope or electrometer.

Although anticipated earlier, it was not until 1902 that it was proved, by Rutherford, that the easily absorbed radiations, called the α rays, which are so active in ionizing, are deflectable by a magnetic field, and in such a direction as to prove that they are positively charged particles. Measurement of the magnetic and electric deflections shows that the α particles are emitted with a velocity about one-tenth that of light and are of mass about twice that of the hydrogen atom. In fact the α particles become, when they lose their charges, helium atoms. This has been proved by allowing the particles to penetrate into a closed glass tube and showing that helium gas accumulates, the mass of helium being equal to the mass of α particles.

The α rays are much like the canal rays in a vacuum tube, while the β rays are exactly like the cathode rays. The α rays, involving a large amount of energy as compared to the β rays, play a much more important part in radioactive processes than the β rays, although the latter may seem of more striking interest on account of their penetration. These two types of radiation are not necessarily given off by the same substance, but are in fact produced quite independently of each other; polonium, e.g., gives only α rays. The α rays from a given substance are quite homogeneous, so that the substance may be recognized by the penetration of its α rays. In passing through matter, air, e.g., the α particles are gradually retarded until their speed is no longer great enough to produce ionization or other effects, and indeed this point where the ionizing power is lost is very sharply defined. As an experiment to show this a screen of zinc sulphide may be brought near to a thin layer of radioactive matter giving off α rays of only one kind. When the screen comes within a few centimeters of the active matter the fluorescence of the screen begins; if it is moved away the disappearance of the fluorescence is just as abrupt, the point of disappearance marking the distance at which the α particles have lost so much of their velocity by collision with the molecules of the air that they can no longer cause fluorescence. This range in air at 15° C. for the α particles from radium itself is 3.3 centimeters from radium C, 6.94 centimeters. This indicates that the α particles emitted from radium atoms have a much less velocity than do those emitted from atoms of radium C. Calculations prove that in the former case it is 1.61×10^9 centimeter per second and in the latter 2.06×10^9. An α particle has to travel with an enormous velocity before it can produce ionization, and Rutherford has shown that the α particles have lost only about half their speed when they cease ionizing, so that they are still going at a speed about one-twentieth that of light. It would be difficult to detect an α radiation with a velocity less than this. The range of α rays in different materials than air is, roughly speaking, inversely proportional to the density. Thus the α rays are generally entirely absorbed by the container when radium is kept in a glass tube or other capsule.

That there is considerable energy in the α rays is shown by the fact that if radium is suitably insulated from loss of heat it reaches a temperature several degrees above its surrounding, owing to the stopping of the α particles by the radium salt itself and whatever vessel contains it and the conversion of their kinetic energy into heat energy. Thus the energy emitted by radium bromide is sufficient to melt its own weight of ice every hour, and this emission of energy is not changed by a change in temperature or any physical or chemical conditions.

Crookes discovered a peculiar phenomenon in the fluorescence caused by α rays. On examining under a lens zinc sulphide while fluorescing he noticed that there was not a uniform glow over the surface, but that the fluorescence came from a succession of tiny sparks appearing and lasting only for an instant, as if each α particle struck a little spark when it impinged on the sulphide. An instrument for showing this interesting spectacle of atoms at work is called the spinthariscope. The photographic action of the α rays is very weak. By taking advantage of the great ionizing effect of the α particles Rutherford and Geiger devised a method for actually counting the number of particles emitted per second in different radioactive processes. Their measurements give the number of α particles expelled per second from one gram of radium itself as 3.4×10^{10}, and from radium in equilibrium 13.6×10^{10}. This method has been extended also to the counting of the β particles.

Besides the α and β radiations there is, always accompanying the β radiation, a third type of very penetrating radiation, not deflectable by a magnetic field and in all respects like X rays of greater penetration than those we ordinarily produce. It would be strange, in fact, not to find such a type of radiation accompanying the β rays, for as in the X-ray tube the X rays are produced by the sudden stopping or change of direction of the cathode particles by the anticathode, so we should certainly expect ether disturbances or pulses to result from the sudden expulsion of the β particles from their atoms, and as the change of velocity of the β particle is certainly more sudden than the stopping of the ordinary cathode-ray particle, we should expect the γ rays to be more penetrating than the X rays. Very little photographic action is produced by the γ rays, since they pass through matter so readily that very little of their energy can be given up to the thin film of a dry plate. The γ rays are approximately half absorbed by a screen of aluminium of 8 centimeters thickness, and their absorption in different materials is closely proportional to their densities.

The α, β, and γ rays all produce a secondary radiation when they impinge on matter, the more abundant the denser the matter. This secondary radiation consists mainly of electrons like the β particle, which are torn loose from the matter and projected with greater or less velocity from the surface. They are of course deflectable in a magnetic field, and their velocity can be measured. The α rays cause only a weak secondary radiation, while the β and γ rays give rise to radiation comparable in penetration and other properties to cathode rays. This secondary radiation, which ceases on the removal of the primary rays, must not be confused with what was formerly called induced or excited radioactivity, which continues after removal of the original radioactive matter.

Early experiments showed that radioactivity is an atomic property, unchanged in total amount by any chemical combination or change in molecular state of the radioactive element, and that temperature changes do not affect it; yet it was found that a chemical separation could be made of radioactive substances from radium, uranium, and thorium, different from the elements themselves. For example, by adding an excess of ammonium carbonate to a solution of uranium a small amount of precipitate very active in β rays was obtained, while the uranium had lost the β-ray activity that accompanied it at first, though the total amount of β-ray activity was unchanged. Within a year the precipitate had lost its activity, while the uranium had regained its β activity. Similarly a small amount of radioactive substance chemically free from thorium may be obtained from the filtrate after precipitation of thorium from a solution by ammonia. This active matter, thorium X, emits α rays and loses its activity at the rate of half in four days. Radium and thorium both give off minute quantities of radioactive gas or emanation. In the case of radium the emanation loses its activity at the rate of half in about four days, the thorium emanation half in one minute. If the thorium emanation is allowed to stand in a vessel for a few minutes, until it loses practically all of its activity, the walls of the vessel will be found to have an invisible radioactive substance on them, which loses its activity at the rate of half in 11 hours. These and many kindred phenomena demanded explanation and have received it through the disintegration theory of Rutherford. According to this theory, now generally accepted, the atoms of the radioactive substances are subject to disintegration, and when an atom disintegrates it does so violently, throwing off the particles that constitute the radiation and from the wreck of the old atom giving rise to a new atom, which may in turn be subject to radioactive disintegration; this process goes on until only stable atoms are formed. That is, radioactivity is an accompaniment, not however a necessary one, of atomic disintegration. The quantitative law according to which this goes on is like that for monomolecular chemical changes; the mass of substance disintegrating in a given time is always the same fraction of the mass of the unchanged substance; e.g., half of a quantity of thorium X disintegrates in four days, half of what is left in the next four days, and so on. Since the radioactivity is proportional to the number of atoms, or mass of substance, disintegrating in a given time, it is by the above law proportional to the amount of undisintegrated radioactive substance, which is an experimental fact. In the case of radium the list of these transformation products includes at least eight different substances, which have been investigated by getting them separated as well as possible by chemical and physical means and studying their radiations and rates of decay into the succeeding products. These transformation products are so small in amount that they can be followed only by observing their radioactivity, not at all by ordinary chemical tests; yet so carefully has the work been done that the existence of transformations unaccompanied by radiations has been proven through their influence on the process of succeeding changes.

The foregoing statement of the essentials of the disintegration theory prepares the way for a list of the several families of radioactive transformation products and descriptions of these substances. Radium itself disintegrates at the rate of half in about 2000 years into the next number of the radium series, the radium emanation, the disintegration being accompanied by α rays only. All radium compounds therefore produce continually radium emanation, which is a gas that may be liquefied under atmospheric pressure at −150° C. Chemically it is quite inert, like the gases of the argon group. When it is generated in solid radium salts it is for the most part occluded and held by them, though it may be released by strong heating or by bringing the radium into solution. This emanation, though procurable in such small amount that its presence, mixed with air or other gas, is ordinarily detected only by its radioactivity, has still been obtained in sufficient quantity to have its volume measured. Ramsay and Soddy purified some of the emanation and examined its spark spectrum, finding that after a few days had elapsed helium lines appeared, though at first there were none present, thus confirming a conjecture of Rutherford that helium, which is found in most radioactive minerals, is a result of the disintegration of radium. (As noted above the α particles form helium gas.) In 1911 Gray and Ramsay succeeded in measuring the atomic weight of the emanation, finding it to be 223, which is in complete accord with Rutherford's theory.

The emanation disintegrates at the rate of half in 3.8 days, accompanied by α rays. The first product of its disintegration is radium A, which is deposited on the walls of the vessel. When first formed radium A gets a positive charge, so that it may all be readily collected from the vessel containing the emanation by putting a negatively charged wire in it. Radium A changes, with emission of α particles, into radium B at the rate of half in 3 minutes, while radium B changes into radium C, with accompanying β radiations only, at the rate of half in 26.8 minutes. A certain proportion of radium C atoms break down by emitting α particles, forming radium C_2; while the remaining radium C atoms are transformed into radium C′ with the emission of β particles, and radium C′ forms radium D with the emission of α particles. The active deposit on the walls of a vessel in which the radium emanation has been standing is a mixture of radium A, B, and C. They are all soluble in acids and may be vaporized by heat. Radium D changes into radium E, half in about 16.5 years, without emission of rays, radium E into radium F, half in five days, with emission of β and γ rays. Radium F is the polonium of Madame Curie, or the radiotellurium of Marckwald. It expels only α particles and disintegrates at the rate of half in 136 days. It is deposited from a solution on a bismuth rod, which serves as a ready means of separating it from the other members of the series. The final product is in all probability the well-known element lead.

Radium bromide in the solid state generally contains all the members of the series, and if it has stood undisturbed for a month or two in a sealed tube, it contains the first five members in radioactive equilibrium, i.e., the quantities of the occluded emanation of radium A, B, and C are such that as fast as one transforms into the succeeding element the quantity is restored by the disintegration of the preceding element. If a radium salt is put in solution the emanation escapes, the radium A, B, and C rapidly decay, and its activity is reduced to about a sixth of its original activity. It however, if sealed up again, regains its activity at the rate of half in about four days at first, then continues to increase very slowly in activity as radium E and F are formed. Since radium itself decays at the rate of half in 2000 years, it is certain that the present supply of radium, in pitchblende, e.g., cannot have existed for more than a few thousand years; so we must believe that radium itself is only a disintegration product of some other element. Many circumstances point to uranium as the parent element, especially the fact that careful analyses have shown that the proportion of radium to uranium in all uranium minerals is substantially the same. Experiments on finding radium after the lapse of a year or more in uranium salts carefully freed from radium at the beginning of the experiment, indicate that uranium is not transformed directly into radium, but that the change must be of slow period and through a series of intermediate radioactive substances. (See below.) This idea has been confirmed by the direct experiments of Soddy (1915).

The thorium series is the next longest. Thorium is the well-known element, atomic weight 232. It changes by three stages into radiothorium, a very active substance first separated from the mineral thorianite. Radiothorium is not easily separable from thorium. It changes into ThX, accompanied by α rays. ThX may be easily separated from thorium or radiothorium solutions. It is soluble in ammonia, and changes into thorium emanation, half in 3.6 days, giving α rays. The emanation is a gas condensing at about —120° C. It is chemically inert. At the rate of half in 54 seconds it changes into thorium A, which, like radium A, is deposited on the walls of the vessel, but can be collected on a negatively charged electrode. Thorium A changes, emitting α rays, into thorium B, half in 0.14 seconds; thorium B, half in 10.6 hours, with β rays, into thorium C, which disintegrates half in a few seconds, giving α, β, and γ rays. Thorium A and B are soluble in acids; thorium A is more volatile than thorium B, and they may be separated by electrolysis in solutions.

The uranium series consists of the heavy element uranium, atomic weight 237, which disintegrates very slowly into uranium X_1 giving α rays; this into uranium X_2; this into uranium_2; and this in turn disintegrates at the rate of half in 24.6 days, giving β and γ rays, into ionium, which in turn disintegrates, forming radium.

The actinium series begins with actinium, which is precipitated by ammonia. It is undoubtedly a disintegration product of uranium. It changes into radioactinium and this into actinium X, losing both α and β particles. Actinium X changes, half in 10.2 days, with emission of α rays, into the actinium emanation, a chemically inert gas. It changes, half in 3.9 seconds, with α rays, into actinium A. Actinium A results from the emanation, and like RaA and ThA it is deposited on bodies and may be concentrated on a negatively charged conductor. It changes, with α rays, into actinium B, half in 0.002 seconds. Actinium B disintegrates at the rate of half in 36 minutes into actinium C; etc.

According to the disintegration theory the liberation of energy by radioactive matter is at the expense of the internal energy of the atoms, and it appears that within the atoms there is a store of energy great in comparison to the energy stored in the molecular heat motion of matter or in its so-called chemical potential energy. For instance Rutherford computes that the energy liberated by one pound of the radium emanation during its disintegration would amount to 60,000 horse-power days. On the other hand, it is not yet possible to set free atomic energy of this sort from ordinary atoms, as it seems beyond the reach of our ordinary influences. Temperature change, which has so great an influence on chemical transformations, has little, if any, effect on the rate of radioactive disintegration, which goes on uniformly at the temperature of liquid air or in a white-hot furnace. As to the form in which this energy exists within the atom there is only hypothesis; yet as it would be hard to conceive of forces great enough to project the α and β particles with such enormous velocities, being suddenly generated in the atom, the view generally held is that the particles are already in rapid orbital motion within the atom and that at the moment of disintegration they leave the atom with the speed already possessed. This view of the atom corresponds well with the facts of spectroscopy and magneto-optical effects. Thomson has shown that a system of many charged particles revolving around a common centre would exhibit many of the properties of the atoms of the elements. It would be in accord with this view to find all matter radioactive, differing greatly in degree, and in fact much work has been done to find out whether radioactivity is a property of matter in general, but the question is still open. Certainly no substance has been found absolutely free from radioactivity, though possibly due to the presence in minute amount of some of the well-known radioactive substances. It may be that all atoms are losing energy by radiation and that the loss of energy is accompanied finally by instability and disintegration, yet it is to be remembered that such disintegration is not necessarily attended by any such violent ejection of particles as we have in the case of radioactive change. It is worthy of note in this connection that the principal radioactive elements, uranium, thorium, and radium, have the highest atomic weights of all the elements, and we might well expect high atomic weight to mean that the atomic structure is complex and most likely to disintegrate.

The distribution of radioactive matter in nature is very extended. Nearly all soils contain a measurable amount; many natural waters, especially those from deep wells and hot springs, contain radioactive gases in solution, and even in the atmosphere there is present everywhere a certain quantity of radioactive gas, doubtless exhaled from the soil, which varies in amount with locality and weather. The radioactive gas in the air and in natural waters is mainly the radium emanation, yet the thorium products also are found. By hanging out in the air a wire charged negatively to a potential of 1000 volts or so, the radioactive deposit from the disintegration of the emanations in the air may be collected and the surface of the wire so charged with it that the rays from it will affect a photographic plate. The active deposit is collected by objects on the surface of the earth, all the more readily since the earth is generally charged negatively with respect to the atmosphere. In laboratories in which experiments on radioactivity are carried on it is difficult to get rid of radiation from undesirable sources, and in fact it cannot be entirely avoided, so thoroughly is radioactive matter disseminated.

The development of heat by radium has already been referred to, so it is obvious that if radium or other active matter is present in as large a proportion throughout the mass of the earth as on the surface, the heat developed from the radioactive energy is considerable. A computation shows that if there is present only 4.6×10^{14} gram of radium per gram of earth the heat generated by the radium will compensate for the heat lost from the earth by radiation. In many specimens of soil the proportion of radium is of about this order, or even higher. The amount of radium cannot be much greater, or the temperature gradient as we go down into the earth would be higher than it is. A consideration of this source of internal heat for the earth allows us to estimate the time during which the earth has not been too hot for the existence of vegetable and animal life on it as very much greater than it would be on the simple theory of cooling by radiation.

As has been noted above, the α particles are positively charged atoms of helium, while the β particles are negatively charged corpuscles, i.e., electrons. The charge carried by the former is twice in amount that carried by the latter; so if any radioactive atom loses one α particle and the new atom loses two β particles, the atom thus formed will be electrically neutral if the original atom was, because the latter will have lost equal amounts of positive and of negative charges. But the mass of the atom formed by these two radioactive processes will be less than that of the original atom by an amount equal to the mass of the helium atom, i.e., 4, when expressed in units of atomic weights. A most interesting and important fact has recently been brought to light through the investigations of Soddy and others: the chemical properties of the original atom and the one formed as described, as the result of the loss of one α particle and two β particles, are identical; they are called isotopes.

This statement may be developed further. If the elements are arranged in a series of rows and columns as in the periodic table, the radioactive atoms all find their proper places according to their atomic weights. But it is known that all the elements in any one column of the table have similar chemical properties; so that isotopes would be expected to fall into the same column, and they do. Soddy has shown, in fact, that the loss of one α particle by any atom shifts the resulting atom two columns to the left in the table and the loss of one β particle shifts it one column to the right. Thus, a loss of one α particle and two β particles brings the resulting atom back into the same column as the original atom.

Consult: R. J. Strutt, *The Becquerel Rays and the Properties of Radium* (2d ed., New York, 1906), an elementary treatise; H. C. Jones, *Electrical Nature of Matter and Radioactivity* (2d ed., ib., 1910); A. T. Cameron, *Radium and Radioactivity* (ib., 1912); Ernest Rutherford, *Radioactive Substances and their Radiations* (ib., 1913); Frederick Soddy, *The Chemistry of the Radio-Elements* (2 vols., London, 1911–14); E. A. Letts, *Some Fundamental Problems in Chemistry* (New York, 1914).

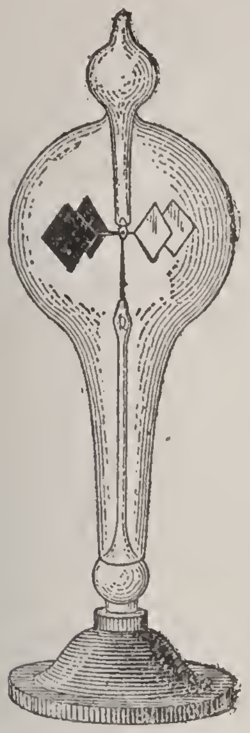
RA′DIOLA′RIA (Neo-Lat. nom. pl., from Lat. *radiolus*, dim. of *radius*, ray). A group of minute marine animals forming an order of rhizopodous Protozoa (q.v.). About 85 families, including many thousand species, are known, most of them microscopic. They live in the surface water of the ocean and their shells, after death, sink to the bottom and form siliceous deposits known as radiolarian ooze. (See Ooze.) They are distinguished from all other Protozoa by their complex and generally very beautiful shells, which are composed of silicon, except in a few cases where either the material is a horny substance called acanthin or the shell is entirely wanting. The radiolarians are further distinguished by the presence of a peculiar, membranous, inner capsule. This is either spherical and perforated by numerous small openings or it is ovoid with a single large opening. Within it are some clear transparent cytoplasm and the nucleus, while outside is a layer of protoplasm which is covered by a gelatinous envelope known as the calymna. The skeleton or shell consists of one or more fenestrated spheres; when more than one are present they are concentric. They are connected with each other by radiating rods and spicules which are usually continued outside the outermost sphere as projecting spines and may be continued inwardly to meet within the centre of the capsule. The pseudopodia are usually very flexible and anastomose freely, but in some cases they are stiff and not inclined to fuse. Contractile vacuoles are not present, but in most radiolarians are very small yellowish spheres, supposed to be parasitic algæ; it is possible that these are concerned with the process of excretion. Reproduction takes place either by fission or by spore formation. In the latter case both macrospores and microspores are formed, and it is supposed that one of each must fuse together to give rise to a new individual. Radiolarians play an important part in the economy of the ocean, furnishing food for countless hosts of minute crustaceans and other animals, which in turn supply the fishes. All recent investigations into the biology of the ocean give an important place to this order.

Fossil Forms. Radiolaria are abundant in a fossil state; they have been found in rocks of most of the geological systems, and in many cases they have formed siliceous rocks of considerable thickness. These latter, described from Brittany, England, and New South Wales, recall the radiolarian ooze of the modern ocean bottom. They are among the oldest known organisms, for they are found in quartzites interbedded with Pre-Cambrian gneiss in Brittany. They occur in abundance in phosphate nodules in the lower Cambrian of New Brunswick, Canada, and in Cambrian rocks of other regions. Cherts and jaspers of Ordovician, Silurian, Devonian, and Carboniferous age in Europe, Asia, and Australia have been found to contain them, often in abundance. The Mesozoic and Tertiary flint-bearing deposits, like the chalk of Europe and America, yield them, and the polishing earths known as Barbados earth and tripoli owe their abrasive powers to them.

Consult: Ernst Haeckel, *Die Radiolarien (Rhizopoda radiaria): eine Monographie* (4 vols., Berlin, 1862–88); Rust, "Beiträge zur Kenntnis der Fossilen Radiolarien," in *Palæontographica*, vols. xxxi, xxxiv, xxxviii (Jena, 1885–94); "Report on the Radiolaria," in Thomson and Murray, *Report of the Scientific Results of H.M.S. Challenger* (London, 1887); Von Zittel and Eastman, *Text-Book of Palæontology*, vol. i (New York, 1900).

RADIOLITES, rā′dĭ-ō-lī′tēz (Neo-Lat. nom. pl., from Lat. *radiolus*, little ray). A very peculiar fossil pelecypod of Cretaceous age, allied to Rudistes. See Rudistæ.

RA′DIOM′ETER (from Lat. *radius*, ray + Gk. *μέτρον*, *metron*, measure). An instrument invented by Crookes and improved by Rubens and E. F. Nichols. It consists essentially of a framework carrying one or more mica vanes supported and free to turn around an axis in an inclosed space from which practically all the air has been exhausted; one face of each vane is coated with lampblack, while the other is polished. In the radiometer of Crookes there are four such vanes carried on a little framework, not unlike a windmill with four arms; and this being pivoted can revolve around an axis. In the form as used by Nichols there are several modifications, the most important of which is that the mica vane is suspended by a torsion fibre and so can no longer revolve freely, but can simply turn through a small angle. In a space so exhausted as that around the mica vanes the particles of the gas are few in number comparatively, and their mean free path may be over a centimeter. If, now, ether waves fall upon the polished surface of the mica, they are reflected and have no action, but if they fall upon the blackened surface they are absorbed and the temperature of this surface is raised. As the particles of the gas now impinge on this heated surface they rebound with an increased velocity, and therefore produce an increased reaction against the surface, pushing it backward. If a Crookes radiometer be exposed to a match, or even the hand if sufficiently close, the mica vanes are set revolving at a high speed. If the gas around the vanes was at ordinary pressures, the molecules would be so close that any increased velocity of the rebounding particles would be transmitted almost instantly throughout the whole gas and so be felt on the polished side as well. Thus there would be no resultant force on the vanes. The above explanation is not to be considered as at all complete, for the action is really most complicated.


CROOKES RADIOMETER.

In the form of instrument used by Nichols it becomes one of the most sensitive thermometers known and it can measure most accurately the energy of the ether waves which its vane absorbs.

Radiomicrometer, or **Microradiometer.** An instrument invented by Vernon Boys to measure the energy of ether waves. It is a combination of a thermopile and a galvanometer with fixed magnets and movable coils. A loop of wire is suspended between the opposite poles of a horseshoe magnet with its plane parallel to the line joining the poles; the two ends of this loop are prolonged out of the magnetic field and joined by a wire of a different conductor. Only one junction of the two different metals is coated with lampblack (if the waves in question are due to ordinary thermal radiations) and exposed to the radiation, the other junction being shielded. The radiation being absorbed by the lampblack produces a rise of temperature; this causes a thermoelectric current, and thus the loop of wire is turned through an angle which may be measured by ordinary means. If the instrument is to be used for measuring the radiation of waves produced by electrical oscillations, a slightly different plan is adopted at the thermal junction. Consult Thomas Preston, *Theory of Heat* (2d ed., New York, 1904).

RA'DIOTELLU'RIUM. A radioactive element, the same as polonium. See RADIOACTIVITY.

RAD'ISH (OF., Fr. *radis*, from Prov. *raditz*, It. *radice*, radish, root, from Lat. *radix*, root). A garden vegetable, *Raphanus sativus*, of the family Cruciferæ, probably a native of Asia, cultivated in temperate regions for its fleshy roots, which are eaten raw. The plant attains a height of about 3 feet and bears white or lilac-colored blossoms on a branched flower stalk. There are two main types of radishes. The summer varieties are annuals and the winter perennials. Both types produce turnip or carrot shaped white or red roots with intermediate forms. Many winter kinds are black. The flesh of all sorts is white. Under favorable conditions the small, summer varieties, which are most used for forcing, may produce edible roots in three weeks or even less. They are commonly grown between the rows of slower-growing crops like lettuce or beets. In beds the seeds are grown in rows about 8 inches apart with one or two seeds to the inch. Radishes grow best on a rich sandy loam soil. Winter radishes are sown in July or in early August. They are usually larger than summer sorts and have much firmer flesh. Another species of radish (*Raphanus caudatus*) is cultivated as an esculent in Japan, where it is native. The wild radish (*Raphanus raphanistrum*) is a troublesome field weed in the eastern United States. Horseradish (q.v.) is a near relative. See Plates of FLOWERS and of VEGETABLES.

RADISH INSECTS, which affect the radish plant in the United States, are for the most part the same species which are found on cabbage and turnips. One important insect enemy is the cabbage maggot, or radish maggot (*Phorbia brassicæ*), which infests the roots of many oleraceous plants. The maggots puncture the fleshy root of the radish and make channels through it in every direction, safely beyond the reach of any insecticide application. The best remedy consists in a combination of nitrate of soda, ground rock, and muriate of potash. This fertilizer should be applied soon after the plants are up and when the leaves are about an inch long, at the rate of 500 pounds to the acre, and before or during a rain. If the application be made at this time it seems to reach the maggots just when they are hatching. The adult flies, which are small brown creatures, lay their white and slender eggs in little masses on the surface of the ground near the infested plants. See CABBAGE INSECTS; ONION INSECTS.

RADISHTCHEV, rȧ-dĭsh'chĕf, ALEXANDER NIKOLAIEVITCH (1749–1802). A Russian author and reformer. He was born in Moscow and, after several years as a page, was educated at Leipzig University. There he spent four years, in which he was more deeply influenced by French philosophy and the Encyclopædists than by his university curriculum. He returned to Russia in 1771 and received a post in the customs administration. In 1790, under the influence of his liberal convictions, he wrote his famous *Journey from St. Petersburg to Moscow* (a work largely modeled after Abbé Raynal's *History of the Indies* and Sterne's *Sentimental Journey*), which, with all its humor and excursive sentimentality, is a terribly vivid picture of Russian serfdom and contains a frank, bold programme of emancipation. Empress Catharine exiled the author to Ilimsk, whence he was permitted to return to Russia in 1796 by Czar Paul. On the coronation of Alexander he was fully pardoned, becoming a member of the legislative commission in 1801. A year later he committed suicide. Radishtchev's *Journey*, the precursor of Turgenev's *Notes of a Sportsman* in its picture and indictment of serfdom, was forbidden in Russia till 1890, while his name could not be mentioned even unfavorably. Necessarily he remained unappreciated for many years.

RA'DIUM (Neo-Lat., from Lat. *radius*, ray). A remarkable chemical element discovered by Monsieur and Madame Curie in 1898. It occurs in all ores containing the element uranium and is generally conceded to be a product of the transmutation of that element. It is obtained from the mineral pitchblende (uraninite), in which a ton of uranium is usually associated with 320 milligrams of radium. After the uranium of the ore has been removed, the residue is washed with hot caustic soda and with water, then with hydrochloric acid and again with water, and then treated with a hot strong solution of sodium carbonate. The solid remaining undissolved contains the radium in the form of carbonate, but associated with relatively very large amounts of barium carbonate and with certain amounts of lead, calcium, polonium, and actinium. After the removal of these last four elements by a more or less complex series of chemical steps, the radium and barium are obtained in the form of chlorides, and the radium chloride is separated out of the mixture by an extended series of fractional crystallizations, advantage being taken of the fact that the chloride of barium is somewhat more soluble than that of radium. Chemically radium behaves so much like barium that an attempt to separate the two elements by a chemical process would be hopeless. In 1910 Madame Curie and Debierne succeeded in isolating metallic radium itself from its chloride. The metal is white as silver and in the absence of air retains its brilliant lustre; in the air it tarnishes rapidly. Water is energetically decomposed by it. The melting point of the metal is about 700° C. (1292° F.). The atomic weight of radium is 226; its chemical symbol is Ra. Radium itself and all its salts continually evolve heat and light. The amount of heat produced by one one-hundredth of a gram of radium, whether isolated or combined with other elements, is 1.18 calories per hour. This radioactivity of the element is the manifestation of a change far deeper going than any chemical change can be, consisting in an actual transmutation of radium into the elements niton and helium (qq.v.). Yet that radium itself is a true element is indicated by everything known about it, among other things by its possessing a spectrum of its own different from that of any other known substance. A gram of radium was valued in 1915 at $37,000. In the United States uranium minerals (mostly carnotite) have been obtained in Colorado and in Utah, the first considerable quantity of pure radium bromide, containing about 300 milligrams of radium, having been prepared in 1914. During the preceding year radium salts valued at $16,218 were imported into the United States.

Extensive work has been carried on by the United States Bureau of Mines, in coöperation with the National Radium Institute, an organization founded by Dr. Howard A. Kelly, of Baltimore, and Dr. James Douglas, of New York, who were deeply interested in the production of radium for hospital use. The Radium Institute secured the right to use carnotite from certain claims in Colorado, and it made a proposition to the Bureau of Mines whereby it would assume the expense of an exhaustive scientific investigation provided that the bureau would supply chemists and mineral technologists to supervise the mining and concentration of the ore as well as the extraction of the radium. An extraction plant was erected at Denver, and not only were known methods of extracting radium from the ore studied, but entirely new methods were developed. One object of this investigation was to secure for American hospitals an adequate supply of radium. The new methods were patented for the benefit of the American people and could be used freely by any one in the United States who could secure the raw material and could carry on under intelligent technical control the various chemical processes involved. In December, 1915, the Bureau of Mines published a bulletin, *Extraction and Recovery of Radium, Uranium, and Vanadium from Carnotite*, which described in detail the different methods of treating radium ores, including the nitric-acid method which was developed in the course of the investigation. This method consisted in first treating the ore with nitric acid, producing an acid solution, and precipitating radium-barium sulphate. The radium-barium sulphate was reduced with carbon, and the resulting radium-barium sulphide was treated with hydrochloric acid, giving a radium-barium chloride from which barium chloride and radium chloride were produced. Up to the time of the publication of the report 4131 milligrams of radium were obtained in the form of high-grade salts, making an average cost of one gram of radium element $37,599, of which the value of the ore was $16,889 and the cost of extraction $20,710.

Consult: W. J. Hammer, *Radium and Other Radio-Active Substances* (2d ed., New York, 1904); Debierne, "Radioactivity," translated by M. A. Rosanoff, in *Journal of the American Chemical Society* (ib., 1911); Frederick Soddy, *Interpretation of Radium* (3d ed., ib., 1912); Moore and Kithil, "A Preliminary Report on Uranium, Radium, and Vanadium," in *United States Bureau of Mines, Bulletin No. 70* (Washington, 1913); Wyatt Malcolm, "Notes on Radium-Bearing Minerals," in *Canada Geological Survey, Proprietor's Handbook, No. 1* (Ottawa, 1914); Lind and Whittemore, "The Radium-Uranium Ratio in Carnotites," in *United States Bureau of Mines, Technical Paper No. 88* (Washington, 1915), and other papers descriptive of the experimental work of the United States Bureau of Mines; also *Radium: A Monthly Journal* (Pittsburgh, Pa., 1913 et seq.). See ALCHEMY; CHEMISTRY, *Chemical Elements*; RADIOACTIVITY.

In Medicine. Radium is employed successfully for the removal and prevention of certain forms of cicatrices, in pruriginous affections of the skin, removal of hairy and pigmented moles, papilloma of the skin, corns, warts, especially those occurring on the hands of X-ray workers, angioma, keloid, rodent ulcer, some forms of epitheliomas, exophthalmic goitre, some forms of sarcoma and carcinoma. Radium is either applied directly to the part to be treated or is given internally in the form of the emanation.

In direct application radium is used in the form of the metal or as a salt, inclosed in a platinum tube and applied to the surface or inserted into the growth. This method of application may be made also by means of applicators, consisting of plates of metal with radium or salts of radium spread on the plate and covered with a special protective varnish. In both methods of application the rays are filtered through a sheet of aluminium to absorb the slow β rays, which, being absorbed by the skin, produce excessive inflammatory reaction without proportionate benefit. If the deep-penetrating γ rays are to be employed for the treatment of deep-seated growths, a filter of lead is used.

Internal treatments are given by the administration, by mouth or injection, of a radioactive solution of radium emanation and water. This method increases tissue oxidation and aids the activity of body ferments. Certain forms of rheumatism have been benefited by this form of treatment. The dose of radium applications is regulated by the amount of radium element and the thickness of the filter used, a large amount of the element applied for a short time producing better results than a smaller quantity applied for a longer time. The strength of radioactive water or the concentration of radium emanation is usually expressed in Maché units per liter. One Maché unit is defined as the saturation ionization current due to the radium emanation, free from decay products, from a liter of solution or gas expressed in electrostatic units multiplied by 1000. Thus radioactive water of 2700 Maché units contains per liter as much emanation as is emitted in 30 days by one microgram of radium. In other words, one Maché unit equals 0.001 electrostatic units, one of which equals 3.33 multiplied by 10^{-10} amperes. Consult: Charles Baskerville, *Radium and Radio-Active Substances: Their Application Especially to Medicine* (Philadelphia, 1905); Dawson Turner, *Radium: Its Physics and Therapeutics* (New York, 1911); N. S. Finzi, *Radium Therapeutics* (London, 1913); also the following papers presented at the International Congress of Physicians and Surgeons at San Francisco, June, 1913, and published in the *Journal of the American Medical Association* for that year: Robert Abbe, "Roentgen-Ray Epitheliomas Curable by Radium: An Apparent Paradox"; Henry Schmitz, "Primary Results of Radium Therapy on Uterine and Rectal Cancers"; Burnham and Kelly, "Radium in the Treatment of Carcinomas of the Cervix Uteri and Vagina"; E. S. Lain, "Radium Energy in the Treatment of Diseases of the Skin." See RADIOACTIVITY.

In Agriculture. That radium affects the physiological processes of plants was early realized, though the results of various early investigators were discordant in many respects. That under certain conditions it acted as a stimulus was shown by Gager, of the New York Botanical Garden (1908), but he also stated that it might retard or prohibit development, or even kill the plant, if used in too great strength or for too long a time. That root development was retarded was reported by Acqua, of Italy, who noted little or no direct effect upon the stems or leaves. Fabre, in France, found beneficial effects from radioactivity corresponding to emanations of one and one-half microcurie for each two liters of air, but injury from greater strength. Rusby, of Columbia University College of Pharmacy, has reported a series of experiments from which he concludes that "the yield of most crops can be increased by the addition of some amounts of radioactive fertilizer, the amount differing with different crops, the beneficial effects continuing over successive crops probably for many years. The largest amount required by any one crop would cost less than the increased market value of such crop of the first year. . . . The fertility of any used ground will increase spontaneously at a much greater rate when treated by radium."

The various experiments on record were carefully examined by Hopkins and Sachs of the Illinois Agricultural Experiment Station, who conclude that the conclusions and claims of the various experimenters are not justified by the facts presented. Two years' field trials made at the station showed that radium applied at a cost of $1, $10, or $100 per acre produced no effect upon the crop yield either the first or the second season.

Experiments at the New Jersey Experiment Station showed no appreciable effects from the use of radioactive material one way or the other.

Ross of the Bureau of Soils of the United States Department of Agriculture, reviewing the results of experiments with radioactive manures in Europe and elsewhere, concludes that while radioactive substances used in botanical research, and possibly in greenhouse practice, might prove of considerable value, the data now available do not warrant the belief that they have any economical and practical application as a fertilizer in general farming. He thinks it "still less credible that the so-called radioactive manure has any value, as far as its radioactivity is concerned, since the radium present on an average in an acre foot of soil is about one hundred times greater than is contained in the quantity of radioactive manure commonly recommended for application to an acre." Consult: C. S. Gager, *Effects of the Rays of Radium on Plants* (New York, 1908); H. H. Rusby, in *New York Botanical Gardens, Journal*, vol. xvi (ib., 1915); also *Experiment Station Record* (Washington, monthly).

RADIUM EMANATION. See RADIOACTIVITY.

RA'DIUS (Lat., rod, staff, spoke, semidiameter, ray). A straight line from the centre to any point on the circumference of a circle (q.v.).

RADIUS OF CURVATURE. See CURVE.

RADIUS VECTOR (Neo-Lat., semidiameter carrier). The linear coördinate in a system of polar coördinates. See COÖRDINATES.

RA'DIX (Lat., root). In mathematics, the base of a scale of notation or a system of powers. See LOGARITHMS; SCALES OF NOTATION.

RADLOFF, rät'lôf, WILHELM (1837–). A German-Russian traveler and philologist. He was born in Berlin, studied there, at Halle, and at Jena, and in 1858 became instructor at Barnaul in western Siberia, a position which he held until 1870. After acting (1871–84) as departmental inspector of Mohammedan schools in Kazan, Radloff was appointed curator of the Asiatic Museum in St. Petersburg. In 1886 he traveled in the Crimea and in 1887 in Lithuania for research in local dialects. In 1908 he received the German Order "Pour le Mérite." His publications include: *Proben der Volkslitteratur der türkischen Stämme Südsibiriens* (10 vols., 1866–1904); *Das Schamanentum und* *sein Kultus* (1885); *Versuch eines Wörterbuchs der Türkdialekte* (1888–1905); two great works in Russian on "Siberian Antiquities" (1888) and the ethnology of the Siberian Turkish peoples (1888); *Atlas der Altertümer der Mongolei* (1892).

RAD'NORSHIRE. A southern inland county of Wales, Great Britain (Map: Wales, C 4). Area, 471 square miles. Groups of mountains, of which Radnor forest (2163 feet high) is the loftiest, cover the greater part of the country. The southeastern district is flat, with a gradual slope towards the east. Of the rivers, the chief of which flow southward, the principal is the Wye, which forms the greater part of the southern boundary. The county formerly comprised large tracts of bog and moor land, which are in course of being gradually reclaimed and cultivated. In the east and southeast districts excellent wheat, barley, oats, and potatoes are grown. Capital, Radnor. Pop., 1901, 23,281; 1911, 22,589.

RADOM, rä'dŏm. A government of Poland. Area, 4769 square miles (Map: Russia, B 4). It is somewhat hilly in the south and level in the north. In the latter part are found also considerable stretches of marsh land. The principal river is the Vistula, which forms a considerable part of the boundary. The climate is damp and unhealthful in the marshy districts. Agriculture is the principal industry. Cereals are raised for export. There are a large number of ironworks. Pop., 1913, 1,155,900, mostly Poles. Capital, Radom.

RADOM. The capital of the Government of Radom, in Poland, situated on the Mleczna River, about 60 miles south of Warsaw (Map: Russia, B 4). It is a well-built town and has manufactures of machinery and leather. Pop., 1910, 49,194. Radom was the scene of a number of diets in the history of Poland. It was allotted to Austria at the third partition of Poland, and became part of the new Kingdom of Poland in 1815. It was captured by the Germans in the European War which began in 1914. See War in Europe.

RADOWITZ, rä'dō-vĭts, Joseph Maria von (1797–1853). A Prussian general and statesman, born at Blankenburg, Brunswick, the son of a nobleman of Hungarian descent. He entered the Westphalian army in 1812 and was wounded and taken prisoner at the battle of Leipzig. In 1830 he became chief of the Prussian general staff of artillery. In 1836 Radowitz was sent as Prussian military commissioner plenipotentiary to the German Diet at Frankfort. In 1842 he was appointed Envoy at the courts of Karlsruhe, Darmstadt, and Nassau, and in 1845 he was raised to the rank of major general. His lively interest in the contemporary politics of Germany is shown in his writings, *Gespräche aus der Gegenwart über Staat und Kirche* (1846) and *Deutschland und Friedrich Wilhelm IV.* (1848). In the Frankfort Parliament Radowitz was the leader of the ultraconservatives, but he subsequently modified his views and favored a constitutional monarchy and a united Germany under Prussian leadership. In September, 1850, he became Prussian Minister of Foreign Affairs, but resigned in November on the failure of his anti-Austrian policy and retired to Erfurt, where he wrote his *Neue Gespräche aus der Gegenwart* (1851). He died at Berlin. Consult Frensdorff, *Joseph von Radowitz* (Leipzig, 1850). His collected works in five volumes were published in Berlin (1852–53).

RADULESCU, rä'dōō-lĕs'kōō, Joan Heliade-. See Heliade-Radulescu.

RADZIWILL, räd-zē'vĭl. An old Lithuanian-Polish family, descended from Nicholas I (1366–1446), Palatine of Vilna, who was equally distinguished as warrior and statesman. The most distinguished modern member of the family was Michael Jerome (Geron) (1778–1850). He served as lieutenant in the war of independence under Kosciuszko until 1794, joined Napoleon on his march into Russia (1812), and was made by him brigadier general. During the revolution of 1830–31 he was for a short time general in chief of the Polish army and after its defeat was transported into central Russia and detained there until 1836, when he retired to Dresden.

RAE, rā, Charles Whiteside (1847–1908). An American naval engineer, born at Hartford, Conn. He graduated from the Rensselaer Polytechnic Institute in 1866 and from the United States Naval Academy in 1868, becoming third assistant engineer in the navy and being promoted through the various grades to chief engineer in 1893. He was a member of the Nicaragua and Tehuantepec surveying expeditions in 1870–71. During the Spanish-American War he served on the *Iowa*. He attained the rank of commander in 1899 and of captain in 1903 and in the latter year became engineer in chief of the navy and chief of the Bureau of Steam Engineers with the rank of rear admiral.

RAE, John (1813–93). A British Arctic explorer, born in the Orkney Islands. He studied medicine at Edinburgh and in 1833 became surgeon at one of the stations of the Hudson's Bay Company, where much of his time was devoted to scientific study. In 1846–47 he explored 700 miles of the coast of Committee Bay. In the following year he joined the land expedition under Richardson to search for Sir John Franklin. In 1850 Rae was again sent out by the government of Great Britain in quest of the lost explorers. During that year the party traveled 5380 miles, covering Wollaston Land and Victoria Land, concerning which nothing had been known, and mapped out 700 miles of new coasts. In 1853 Rae set out with another party, under the Hudson's Bay Company, with the object of completing the survey of the west coast of Boothia. During this journey he obtained definite news of Franklin's fate, and upon returning to civilization with the news found that his party had earned the reward of £10,000 offered for the first accredited information of the lost explorer. In 1858, 1860, and 1864 he took a prominent part in various expeditions in Arctic America. His activity and endurance bordered upon the marvelous. He walked 23,000 miles in the course of his various journeys and explorations and discovered more than 1700 miles of coasts. In 1852 he was awarded the Founder's gold medal of the Royal Geographical Society and he was also honored by other learned bodies. During the later years of his life he held offices in corporations and institutions concerned with colonial matters. Rae published, in 1850, *Narrative of an Expedition to the Shores of the Arctic Sea in 1846 and 1847*. Consult also Richardson, *Arctic Expeditions* (London, 1852–53), and id., *Polar Regions* (ib., 1861).

RAE, John (1845–1915). A British economist, born at Wick, Scotland, and educated at the University of Edinburgh. He wrote for English periodicals, made a special study of the history of economics and of modern economic tendencies, and published: *Contemporary Socialism* (1884; 4th ed., 1908; It. trans. by Angelo Bertolini, 1895), a valuable study; *Eight Hours for Work* (1894); *Life of Adam Smith* (1895).

RAEBURN, rā′bûrn, Sir Henry (1756–1823). A Scottish portrait painter. He was born at Stockbridge, near Edinburgh, March 4, 1756, and at the age of 15 was apprenticed to a goldsmith at Edinburgh, painting water-color miniatures during his leisure hours. From David Dencliar, an etcher, and David Martin, a local portrait painter, he received some inspiration and learned to adopt a broader treatment in miniatures. Encouraged by his success in this branch of art, he began to fit himself for portrait painting by copying portraits in oil. After contracting a fortunate marriage in 1778, he was enabled to study abroad, to which he was urged by Reynolds, whom he met on a visit to London. After studying for two years at Rome, he returned to Edinburgh in 1787 and soon attained great popularity and exercised marked influence on the development of Scottish art. He was elected president of the Society of Artists in Scotland in 1812 and Royal Academician in 1815. On a visit of George IV to Edinburgh in 1822 he was knighted and the following year was appointed the King's limner for Scotland. He died at Edinburgh, July 8, 1823. Raeburn occupies a position in Scottish art similar to that of Reynolds (q.v.) in English. His portraits are strikingly realistic and intense and are painted in full light. His work has been compared to that of Frans Hals and Velazquez, whom he resembles in this regard and in his facile brushwork. The most notable Scotchmen were among his sitters, such as Robertson, Hume (Parliament House, Edinburgh), Jeffrey, Dugald Stewart, Braxfield, John Erskine, and Sir Walter Scott. He is best represented in the public galleries at Edinburgh and Glasgow. The former contains the masterpieces Mrs. Campbell of Balliemore, Lord Newton, and the portrait of himself. He is also represented in the National Portrait Gallery of Edinburgh and of London, in the National Gallery, London, and the Royal Academy, London. In the Metropolitan Museum, New York, is a fine portrait of James Forsythe, and in the J. P. Morgan collection are portraits of Isabella Ross (Mrs. Bell) and Lady Maitland, two masterpieces. Among his finest portraits in British private collections are Sir John Sinclair, Lord President Dundas, Lady Stewart of Coltness, and the MacDonalds of Clanranald. Consult: Sir W. Armstrong, *Sir Henry Raeburn* (London, 1901), containing a descriptive catalogue of his works by J. L. Caw; *Masters in Art*, vol. vi (Boston, 1905), containing an exhaustive bibliography; R. S. Clouston, *Sir Henry Raeburn* (New York, 1907); James Greig, *Sir Henry Raeburn: His Life and Works* (London, 1911).

RAE PROCESS. See Gold, *Metallurgy*.

RÆTIA. See Rhætia.

RAFF, räf, Joachim (1822–82). A German composer, born at Lachen, Switzerland. He first engaged in scientific studies, but studied music under Mendelssohn and in 1850 followed Liszt to Weimar. He published *Die Wagnerfrage* (1854), in which he advocated Wagner's theories. In 1856 he went to Wiesbaden, where he gave all his time to composition until 1877, when he was called as director to the new Conservatory of Music at Frankfort-on-the-Main, where he remained till his death. Raff was a prolific writer, his compositions, numbering over 200, including notable examples of nearly every musical form. He was possessed, however, of a facility of invention which poverty frequently drove him to employ to the detriment of his reputation; hence the uneven character of his work. By the end of the century his works had practically disappeared from the concert programmes. Among his 11 symphonies the third, *Im Walde*, and the fifth, *Lenore*, once were among the most popular works of their kind. He also wrote four suites for orchestra, five overtures, a concerto for piano, two concertos for violin, two for cello, an oratorio, *Weltende, Gericht, neue Welt*, a great quantity of chamber music, and works for piano solo and four hands. Of his six operas only two, *König Alfred* (1851) and *Dame Kobold* (1870), were performed. Consult R. Gandolfi, *La musica di Gioacchino Raff* (Florence, 1904).

RAFFAELINO DEL GARBO, rȧf′fȧ-ĕl-ē′nō̇ dĕl gär′bō̇ (1466–1524). A Florentine painter of the early Renaissance, whose real name was Raffaello Capponi. He was born in Florence, studied under Botticelli and Filippino Lippi, and was influenced by Ghirlandaio and Perugino. In his earlier period he was a promising though somewhat affected follower of Lippi, but he was not sufficiently gifted to adopt the High Renaissance, and finally degenerated into a mere craftsman. Among his chief works are the "Resurrection," Florentine Academy; a "Madonna," Museum of Naples; "Madonna and Angels," Berlin Museum. A notable portrait of a "Young Man" is in the Layard Gallery at Venice.

RAFFAELLI, rȧ′fȧ′ĕ′lē′, Jean François (1850–). A French painter, sculptor, and etcher, born in Paris. He began his career as a singer, then studied art under Gérôme, and first exhibited in 1870. But he did not fully reveal himself until an exhibition of his works held in 1884, for which he wrote a catalogue, *Etude des mouvements de l'art moderne et du beau caractérisme*. Though powerfully influenced by the Impressionist movement and by the purely naturalistic school, he was, like Degas, rather an independent in his own methods. He is especially a student of character, and in his early works deals mostly with low life in the suburbs of Paris, often in winter. The backgrounds are long straight roads, bordered by slender trees, and the typical suburban buildings beneath a melancholy lowering sky. Good examples of this style are "The Absinthe Drinkers" (Mrs. Potter Palmer, Chicago) and "The Old Convalescents" (1892, Luxembourg). Afterward his range became wider and his later works are more happily conceived. Spring takes the place of winter in delicate luminous landscapes, and he paints such pictures as the series of views of Notre Dame, the "White Horse"; the charming portrait of his daughter Germaine (1896); "Young Girl Regarding herself in a Mirror" (1897); "Portrait of Mademoiselle Marie Louise" (1898); "Young Girl with the Cornflower." Other pictures by him are: "At Gonon's Foundry" (Lyons Museum); "Old Ragpicker" (Nantes); and the portrait of Edmond de Goncourt (Nancy). He is represented in all the public museums for modern painting in Paris and in several provincial museums; also at Berlin, Dresden, Brussels, Rome, in the Metropolitan Museum, New York, and in the museums of Philadelphia, Pittsburgh, Rochester, and Buenos Aires. His medium is generally oil or pastel, and he is the inventor of a new method of using solid oil tubes in painting, which has so far proved successful. His work as a sculptor includes bas-reliefs, portraits, and character studies in plaster and bronze. His drawings were published in the *Revue Illustrée* and as *Types de Paris* (1889). He also became known as an able etcher. In 1889 he received a gold medal at the Universal Exposition and also the Legion of Honor. He wrote a charming guide to the paintings of the Louvre (Paris, 1913). Consult Gustav Coquiot, in *Gazette des beaux arts*, 4th series, vol. v (Paris, 1911).

RAFFAELLINO, rȧf'fȧ-ĕl-lē'nȯ. See COLLE, RAFFAELLO DAL.

RAFFAELLO, rä'fȧ-ĕl'lȯ. See RAPHAEL.

RAFFALOVICH, rȧ'fȧ-lô'vĭch, ARTHUR (1853–). A French economist, born at Odessa, Russia. He was educated in France at the Collège Sainte-Barbe and at the Lycée Louis-le-Grand. For distinction in his special field he was decorated by various foreign governments and was made a Grand Officer of the Legion of Honor. He wrote: *Le logement de l'ouvrier et du pauvre* (1887); *Les coalitions de producteurs et le protectionnisme* (1889); *Mémoire sur la conférence de la paix* (1899); *Les primes et subventions à la marine marchande* (1903); *Le marché financier*, 2d series (1905–14). Raffalovich also translated works of various English and American economists. Much of what he wrote was contributed to the *Journal des Economistes* and other periodicals.

RAFFET, rȧ'fȧ', DENIS AUGUSTE MARIE (1804–60). A French lithographer and illustrator. He was born in Paris and studied with Cabanel, Charlet, and Gros. His earliest efforts are imitations of Vernet and Charlet. His individuality appeared in a series of lithographs glorifying the soldiers of the Revolution and the First Empire, with Napoleon for the central figure. Among the best of these are "The Capture of Fort Mulgrave," "The Last Charge of the Red Lancers," and the poetically imaginative masterpiece "The Midnight Review." "The Battle of Oued-Alleg" is the finest of his drawings of the French soldiers of Algeria. In 1850 he began his superb series on the siege of Rome. His 100 lithographs, called *Voyage dans la Russie méridionale et la Crimée* (1833–49), show his talent in still another direction. Raffet was a precise and remarkably gifted draftsman and a master of composition, excelling particularly in rendering the multitude of an army. Among the many works illustrated by him are the *Musée de la Révolution* (1843), Norvin's *History of Napoleon*, and Thiers's *History of the Revolution* and *History of the Empire*. A complete catalogue of Raffet's works was published by Giacomelli (Paris, 1862). Consult: Armand Dayot, *Les peintres militaires, Charlet et Raffet* (Paris, 1892); the monographs by Bry (ib., 1874) and M. F. Lhomme (ib., 1892); Atherton Curtis, *Auguste Raffet* (New York, 1903).

RAF'FIA. See JUPATI PALM.

RAFFINASE, răf'ĭ-nās. See ENZYME.

RAFFINOSE, răf'ĭ-nōs. See SUGARS.

RAFFLES, SIR THOMAS STAMFORD (1781–1826). A British colonial administrator, born July 5, 1781, at sea off the island of Jamaica, on board the ship commanded by his father. At the age of 14 he got employment in the East India House as an extra clerk. He soon attracted attention and in 1805 received an assistant secretaryship in Penang, mastered the Malay language on the voyage out, and in 1807 became secretary and registrar of the Recorder's Court. He visited Malacca, studied its resources and persuaded the company to reverse its decision to abandon that post. In 1810 he proceeded to Calcutta, where he met Lord Minto, the Governor-General. For rendering important service Raffles was made Governor of the island of Java, and for five years he administered the affairs of the island with marked vigor, wisdom, and success. He abolished forced labor, regulated taxation, and remodeled the administration of justice, while retaining the Dutch colonial laws. On the restoration of the island to the Dutch in 1816 he returned to England and published his great work on the *History of Java* in 1817. He was knighted, and by request visited Holland to advise with the King in regard to the policy to be pursued in Java. In 1818 he became Governor of Benckulen in Sumatra. In 1819 he founded Singapore, a master stroke to insure the success of the British in trade competition with the Dutch. Compelled by ill health to return home, he set sail in 1824, but the ship having caught fire, he lost everything, including his great natural-history collection, his manuscripts, drawings, and notes, valued at $100,000. He reached Plymouth later in the same year, and died suddenly on his birthday, 1826, near London. His portrait is in the National Portrait Gallery, London. Consult his *Memoir by Lady Raffles* (London, 1830); D. C. Boulger, *The Life of Sir Stamford Raffles* (ib., 1899); H. E. Egerton, *Sir Stamford Raffles* (ib., 1900).

RAFFLE'SIA. A genus of 8 or 10 species of plants of the small parasitic family Rafflesiaceæ, the visible parts of which consist merely of a flower. The species attack *Cissus*, making their appearance at first as hemispherical swellings of the bark of the root and, after the bark has broken, rising in the form of a cabbage head, while the perianth is covered with imbricated bracts, which are more or less recurved after it has opened. The vegetative part, which ramifies in the tissues of the host, resembles the mycelium of a fungus. After the flower has expanded it diffuses a carrion-like smell, which induces flies to deposit their eggs.

RAFIN, rȧ'făɴ', CATHERINE JOSÉPHINE. See DUCHESNOIS, CATHERINE.

RAFINESQUE, rȧ'fē-nĕsk', CONSTANTINE SMALTZ (1783–1840). An American botanist, of French-German descent, born at Galata (Constantinople). On his first visit to the United States in 1802 he spent three years in Pennsylvania and Delaware collecting botanical specimens. Afterward he went to Sicily and was there 10 years, during which time he continued to study botany and wrote several scientific works in Italian. He was shipwrecked off the coast of Long Island in 1815, on his way to New York, and lost his collection of manuscripts and books. In 1818 he became professor of botany at Transylvania University, Lexington, Ky. Ultimately he settled in Philadelphia. Though a man of wide learning, his works are marred by his tendency to multiply species and by frequent inaccuracies. They include: *Ichthyologia Ohioensis* (1820); *Annals of Kentucky* (1824); *Medical Flora of the United States* (1828–30); *Atlantic Journal and Friend of Knowledge* (8 numbers, 1832–33); *The Complete Writings of C. S. Rafinesque on Recent and Fossil Conchology* (1864, ed. by W. G. Binney and G. W. Tryon). Consult: Asa Gray, "Botanical Writings of Rafinesque," in *Silliman's Journal* (New Haven, 1841); R. E. Call, *The Life and Writings of Rafinesque* (Filson Club Publications, Louisville, 1895); T. J. Fitzgerald, *Rafinesque: A Sketch of his Life with Bibliography* (Historical Department of Iowa, Des Moines, 1911).

RAFN, räf'n, CARL CHRISTIAN (1795–1864). A Danish critic and archæologist. He was born at Brahesborg in Fyn and was educated at the University of Copenhagen, of which he was appointed sublibrarian in 1821. In 1825 he founded the Society of Northern Antiquities, as secretary of which he edited and published many ancient Norwegian-Icelandic manuscripts occupying about 70 volumes. His most widely known work is *Antiquitates Americanæ* (1837), discussing the question of the discovery of America by the Norse. This he followed up with *Historical Monuments of Greenland* (3 vols., 1838–45), with Finnur Magnússon. He was also a collaborator on other voluminous and important compilations of sagas and historical manuscripts.

RAGATZ, rä′gȧts, or **RAGAZ.** A tourist resort in the Canton of Saint-Gall, Switzerland, 11 miles northwest of Chur (Map: Switzerland, D 1). It is attractively situated at the mouth of the Tamina Gorge above the confluence of the turbulent Tamina with the Rhine, and commands a fine view of the Rhine valley. Its chief features are the Kursaal and gardens, the mineral springs and baths, and Bad Pfäfers (q.v.). There is a monument to Schelling in the cemetery. Ragatz attracts annually an average of 50,000 visitors. Permanent pop., 1910, 2063.

RAGGED ROBIN. See LYCHNIS.

RAGGED SCHOOLS. Schools maintained by private philanthropy in various English cities. It is not certainly known who first suggested them, but credit for a successful experiment is due to a poor shoemaker, John Pounds, of Portsmouth, who for 20 years prior to his death, in 1839, gathered poor children about him and taught them as he worked. In 1838 London had a ragged Sunday school, which later became a free day school. The school at Field Lane was opened in 1843. The first free boarding school was started by Sheriff Watson in Aberdeen in 1841. In 1845 Dr. Robertson opened a similar school in the Vennel, Edinburgh. In 1847 Dr. Guthrie published his well-known *Plea for Ragged Schools.* The movement spread and in a few years ragged schools were to be found in most of the cities. The further development of the English school system, particularly under the Acts of 1870 and 1872, which introduced compulsory school attendance in England and Scotland, merged many of the ragged schools into the public schools. After 1851 the ragged schools received small grants from the general funds and a capitation grant of £2 10s. was allowed by the Privy Council from 1856 to 1859. Consult Cornwallis, *Philosophy of the Ragged Schools* (London, 1851).

RAGGEE, răg′ė (from Hind. *rắgī*), *Eleusine corocana.* An Indian grain. See ELEUSINE.

RAGHUVAMŚA, rŭg′hụ-vŭɴ′shȧ (Skt., family of Raghu). The title of a celebrated Sanskrit poem by Kālidasa (q.v.). In 19 cantos it describes the life of Rama (see RAMAYANA) and his forefathers and descendants. The first nine cantos treat of Rama's four immediate ancestors, the next six contain the story of Rama, agreeing in the main with the *Ramayana,* and the last four deal with his nearest descendants as well as the 24 kings of Ayodhya who, according to the myth, traced their ancestry to him. The work is one of considerable beauty, especially in its similes, and is characterized by rapidity of movement, simplicity of style, and poetic charm. Of the more than 20 commentaries on the text the best known is Mallinatha's *Samjīvanī,* which contains an explanation for every word of the poem. The text of the Raghuvamśa has been edited repeatedly. The most important editions are those of Stenzler with a Latin translation (London, 1832), by Pandit with the best native commentary on the poem, that of Mallinatha (Bombay, 1869–74), and also by Parab (ib., 1892), by Jvalaprasad with an English translation (ib., 1895), and English translations by Patankar (Poona, 1896) and by Johnstone (London, 1902). Consult Mark Collins, *The Geographical Data of the Raghuvamśa and Daśakumāracarita, Considered More Especially in their Bearing upon the Date of these Works* (Leipzig, 1907), and A. A. Macdonell, *History of Sanskrit Literature* (London, 1913).

RAG′LAN, LORD FITZROY JAMES HENRY SOMERSET, first BARON (1788–1855). An English field marshal, eighth son of the fifth Duke of Beaufort, born Sept. 30, 1788. He entered the army in 1804 and went to the Peninsula in 1808 as aid-de-camp of Sir Arthur Wellesley (later the Duke of Wellington), whose military secretary he became three years afterward. He took part in all the great actions of the Peninsular campaign and gained special distinction at the storming of Badajoz (1812). In 1815 he served under the Duke of Wellington in Belgium and lost his right arm at Waterloo. From 1815 to 1818 he was secretary of the British Embassy at Paris. He was member of Parliament for Truro in 1818–20 and 1826–29. When Wellington was appointed master of the ordnance in 1819, he again chose Somerset as his secretary; and three years afterward Somerset accompanied his chief to the Congress of Verona. In 1827 the duke was appointed commander in chief of the British army and called Somerset to the Horse Guards as his military secretary. This office he held till the death of Wellington in 1852. He was then made master general of the ordnance, and in October was called to the House of Peers as Baron Raglan of Raglan in Monmouthshire. In 1854 he was appointed, with the rank of general, commander of the English forces dispatched to operate against Russia, and was subsequently made a field marshal, but died June 28, 1855.

RAGNARÖK, räg′nȧ-rôk′. In Scandinavian mythology, the end of the world and the fall of the gods before the combined demon hosts of the world. The word *ragnarök* really means judgment of the gods, but through confused etymology appears in the Younger Edda as *ragnarökr,* twilight of the gods, which as the Götterdämmerung has formed the basis of the

Wagnerian music drama *Der Ring des Nibelungen.* The fundamental conception of the *ragnarök* is the end of the Golden Age, brought about by the conflict of the two types of Norse gods, known respectively as Æsir and Vanir, and by the Æsir's violation of their oaths. The chief source of these conceptions is the poem of the Elder Edda, called the *Völuspá*, a mixture of heathen and Christian conceptions. The battle between the gods and demons is ushered in with the appearance of the divine war maidens, the Valkyries. Balder, the beautiful god, is dead, through Loki's malignant treachery, and his fate seals the doom of the other gods. The giant watchman Eggther strikes his harp, and in each of the three worlds, that of the giants, the Æsir, and Hel, a cock crows calling the warriors to the battle. The hellhound Garmr bays aloud; the wolf Fenrir tears his chain. On the earth men are engaged in bloodshed and incest. Floods rise everywhere. The old world tree, the ash Yggdrasill, sways to its roots. Then the god Heimdalr sounds his horn, calling the gods to the fray. In mighty array the demon hosts come marching against the gods from the east, north, and south. Odin engages in combat with Fenrir; Freyr with Surtr; Thor with the serpent Midgard; all the three gods fall in the struggle. The demons are masters of the battle field. The sun grows black, the earth sinks into the sea, the stars fall from heaven. Vapor and fire rage, the high flame licks the sky. The world and the gods are gone. But from out of the flood rises a new earth which unsown grows grain, and the Æsir come again. Consult R. B. Anderson, *Norse Mythology* (7th ed., Chicago, 1901), and P. D. Chantepie de la Saussaye, *The Religion of the Teutons* (Eng. trans. by B. J. Vos, Boston, 1902). See Mythology.

RAG′TIME′. The popular title given to the humorous dance or vocal music of negro origin and characteristics which has had great vogue since the early nineties of the last century. Theoretically the music of such compositions is an excessive exaggeration of syncopation. The general lack of instruments other than of percussion among the different African races of necessity inclined them to punctuate their melodies with strongly marked pulses or accents. Crude emotional effects are gained by increased noise and abrupt syncopation. The very exaggeration of ragtime proved its strongest appeal to the general public. See Negro Melodies.

RAGUENEAU, rȧg′nȯ′, Paul (1608–80). A French missionary and explorer, born in Paris. He became a Jesuit priest in 1626 and in 1636 was sent as a missionary to Canada, where for a time he labored among the Hurons. In 1640 he went among the hostile Iroquois in an unsuccessful attempt to secure the release of some French prisoners. Ten years later, as father superior, he was active in gathering the remnant of the Hurons who had escaped the massacres by the Iroquois. In 1657 with another priest and a few lay companions he visited the Onondaga tribe of Iroquois; while among them a plot was formed to murder him, and he escaped with great difficulty. In 1662 he returned to France, where he labored as the agent for the missions in New France. His writings give a good picture of the conditions under which the Jesuits of New France labored, and one of his *Relacions* (that for 1648) contains the first mention of Niagara Falls. Besides these accounts (7 vols., Paris, 1647–57), he wrote *Vie de la mère St. Augustine, religieuse hospitalière de Quebec en la Nouvelle France* (Paris, 1672), etc. Consult: *The Jesuit Relations and Allied Documents*, edited by R. G. Thwaites (73 vols., Cleveland, Ohio, 1896–1901); Francis Parkman, "The Jesuits in North America," in *France and England in North America*, part ii (Boston, 1902); T. J. Campbell, *Pioneer Priests of North America* (Baltimore, vol. i, rev. cd., 1913; vol. iii, 1911).

RAGUET, rȧ-gā′, Condy (1784–1842). An American merchant and political economist. He was born in Philadelphia and studied at the University of Pennsylvania. In 1804–05 he visited Santo Domingo twice and wrote on conditions in that island. He took part in the War of 1812, was admitted to the bar in 1820, and from 1822 to 1827 was United States Consul at Rio de Janeiro. When subsequently made chargé d'affaires he negotiated a treaty with Brazil. He was an exponent of free trade and wrote on that subject *The Principles of Free Trade* (1835). His other works include *An Inquiry into the Causes of the Present State of the Circulating Medium in the United States* (1815) and *On Currency and Banking* (1839; Fr. trans., 1840).

RAGU′LY. A term applied to an irregular line employed in heraldry (q.v.).

RAGUSA, rȧ-gōō′zȧ (Slav. *Dubrovnik*). An episcopal city and fortified seaport in the Crownland of Dalmatia, Austria, situated at the foot of San Sergio, 50 miles south-southeast of Mostar (Map: Austria, E 5). It is a walled city with many towers and intersected by the Corso, once an arm of the sea and now containing the most interesting features of the town, including the Palazzo Rettorale, the former residence of the rectors of the Republic, the old mint, the customhouse, and the cathedral completed in 1713. Among other buildings may be mentioned the Palazzo Communale, the museum, and the theatre. The harbor is small and unprotected and most of the heavier vessels anchor at Gravosa, about 4 miles from the town. The chief products are oil, silk, leather, and liqueurs. There is some transit trade with Herzegovina. Pop., 1900, 13,174; 1910, 11,561.

Ragusa is believed to have been founded about the middle of the seventh century by refugees from Ragusa Vecchia, or Old Ragusa (the ancient Epidaurus), probably destroyed by the Slavs. Although successively subject to Constantinople, Venice, Hungary, Servia, and Bosnia, Ragusa enjoyed a considerable degree of autonomy and repeatedly fought against every encroachment on its independence. At the close of the Middle Ages it became tributary to Turkey, and under Turkish overlordship rose to the position of one of the principal centres of commerce in south Europe. Its territory embraced over 500 square miles. Its institutions were aristocratic. The plagues during the sixteenth century and the frequent earthquakes, especially that of 1667, when the town lost one-fifth of its inhabitants, put an end to the prosperity of the little Republic. Seized by Napoleon in 1806, it was deprived of its independence in 1808 and awarded to Austria by the Congress of Vienna in 1814. From the fifteenth to the eighteenth century Ragusa was a great seat of South Slavic literature. The most famous of the Ragusan poets was Gundulič (q.v.), who died in 1638. In 1915 the town was bombarded by the Italian fleet from the Adriatic and it was also threatened by an invading force of Montenegrins. See War in Europe. Consult T. J. Jackson, *Dalmatia*, vol. ii (Oxford, 1887), and F. H. Jackson, *Shores of the Adriatic* (New York, 1908).

RAGUSA. A city in the Province of Syracuse, Sicily, situated on a steep ridge, on the right bank of the Ragusa, 15 miles from the sea and 32 miles by rail west-southwest of Syracuse (Map: Italy, E 6). The city has a Gothic church, a Gymnasium, and a technical school. There are manufactures of silk, cotton, woolens, and furniture, and a trade in wine, oil, cattle, and cheese. Remains of a Greek colony of the sixth century B.C. have been found near the town. Pop. (commune, including Ragusa Inferiore), 1901, 31,922; 1911, 39,850.

RAGUSA, Duke of. See Marmont, Auguste.

RAHBEK, rä'bĕk, Knud Lyne (1760–1830). A Danish poet and author, born in Copenhagen. He was educated at the University of Copenhagen and was appointed professor of æsthetics there in 1790. From 1785 to 1809 he directed the *Minerva*, a literary periodical of great influence, and he also edited *Den Danske Tilskuer* (The Danish Spectator) in 1791–1808 and in 1815–22. His own works include numerous editions of the Scandinavian poets, particularly Holberg; the critical *Ludvig Holberg som Lystspildigter* (3 vols., 1815–17); *Danske Læsebog* (1791–1804); *Bidrag til den danske Digtekunsts Historie* (4 vols., 1800–08), with Nyerup; *Erindringer* (6 vols., 1824–29).

RAHL, räl, Karl (1812–65). An Austrian historical and portrait painter. He was born in Vienna, son and pupil of the engraver Karl Heinrich Rahl (1779–1843). He also studied at the Vienna Academy and in Munich and Stuttgart and in 1836 went to Italy. There he cultivated an eclecticism which borrowed color and technique from the Venetians and composition from Raphael and Michelangelo. He returned to Vienna at intervals, but lived mostly in Rome until 1847. The most important works of his early period are: "The Finding of Manfred's Body" (1838); "Persecution of Christians in the Catacombs of Rome" (1844, Kunsthalle, Hamburg; replica, 1849, National Gallery, Berlin); "Entry of Manfred into Lucera" (1846, Vienna Museum). In 1848 he took up his abode in Munich, where he remained till appointed to a temporary professorship at the Vienna Academy in 1850. He resigned after one term and opened a private school of painting which gave a new impetus to Austrian art. He won deserved recognition in 1856 through the patronage of Baron Sina, the Greek banker, who commissioned him to decorate the Greek church in Vienna, and for whose palace in Vienna he painted in 1861 four "Episodes from the Heroic Age of Greece" and the "Four Elements." The façade of the Heinrichshof he decorated in 1862 with 12 allegorical figures of "The Arts of Peace," and the staircase of the Arsenal in 1863 with a series of fine allegories. He had shortly before been appointed professor at the academy. Among more than 400 portraits attributed to him are those of many contemporary celebrities in art, literature, and science. Much of his later work has a healthy robustness reminiscent of Rubens. Consult Hottner, *Karl Rahl* (Vienna, 1863), and George-Mayer, *Erinnerungen an Karl Rahl* (ib., 1882).

RAHU, rä'ho͞o (Skt. *Rāhu*, the seizer, from *rabh*, Gk. λαμβάνειν, *lambanein*, to seize). In Indian mythology, the son of Vipracitti and Simhika and the demon who is the cause of the eclipses of sun and moon. At the churning of the milk ocean Rahu, one of the Daityas or demons, came unnoticed among the gods and obtained a portion of the ambrosia thus produced. His head was cut off by Vishnu; but the nectar had reached his throat and consequently his head had already become immortal. Out of hatred for the sun and moon, who had informed on him, he now pursues them with implacable hatred, seizing them at intervals and thus causing their eclipses. According to a later form of the legend both the head and the tail of the demon called Ketu ascended to heaven and there still produce the eclipses of sun and moon either by swallowing them or by making them unclean by his approach. Rahu was accordingly reckoned among the planets which, on account of their wanderings, are regarded as of evil omen. In modern India he is the godling of two low-caste tribes, the Dusadhs and Dhangars, in the eastern districts of the Northwest Provinces, where he is propitiated by the rite of passing through a fire kindled in his honor. Rahu is a post-Vedic demon, his Vedic predecessor as the fiend who eclipses the sun being Svarbhānu. In Hindu astronomy Rahu is the moon's ascending, and Ketu is its descending node. Consult A. A. Macdonell, *Vedic Mythology* (Strassburg, 1897), and W. J. Wilkins, *Hindu Mythology, Vedic and Purānic* (2d ed., London, 1900).

RAHWAY, rạ'wȧ. A city in Union Co., N. J., 20 miles southwest of New York City, on the Rahway River and on the Pennsylvania Railroad (Map: New Jersey, D 2). An attractive suburban city, Rahway is well laid out and has many handsome residences of business men of the greater cities in the vicinity. There is a public library. As an industrial centre Rahway is of considerable importance, its establishments including an extensive printing house and manufactories of automobile bodies, cereals, vacuum cleaners, shellac, oils, clothing, chemicals, felt goods, music boxes, carriages, electrical supplies, and shirts. Pop., 1900, 7935; 1910, 9337; 1915 (U. S. est.), 10,077.

RAIBOLINI, rī'bȯ-lē'nė, Francesco. See Francia.

RAIFFEISEN, rīf'ī'zen, Friedrich Wilhelm (1818–88). A German economist, founder of the German agrarian loan funds, born at Hamm an der Sieg. In 1835 he entered the army, but was compelled to abandon that profession because of an affection of the eyes, and entered the civil service. The agricultural crisis of 1846–47, which Raiffeisen believed to be due to the difficulty with which the small landowner secured credit, led him to establish in Heddesdorf and Weyerbusch mutual credit associations, through which the small farmer might obtain loans at a low rate of interest, thereby escaping his former dependence upon usurers. Raiffeisen carried on an extensive propaganda for his idea, organizing numerous mutual credit associations, until in 1866 his health was so shattered by overwork that he was compelled to retire from public service. After he had partially recovered he founded in 1878 the *Landwirtschaftliches Genossenschaftsblatt*, published at Neuwied. Before his death the agricultural loan associations had become numerous and had proved of the greatest value to the small farmers. Raiffeisen wrote: *Instruktion zur*

Geschäfts und Buchführung der Darlehnskassenvereine (1869); *Die Darlehnskassenvereine* (1887); *Kurze Anleitung zur Gründung von Darlehnskassenvereinen* (1888).

RAIKES, rāks, Robert (1735–1811). The founder of Sunday schools. He was born at Gloucester, England, Sept. 14, 1735, succeeded his father as printer and proprietor of the Gloucester *Journal* (1757), and so continued till 1802. He is first heard of in connection with volunteer jail visitation (1768), and called public attention to the pitiable condition of the prisoners. In July, 1780, he opened in Gloucester his first school on Sunday for the instruction of children, designed at first to teach poor children the rudiments of education. Consult: G. Webster, *Memoir of R. Raikes* (Nottingham, 1873); A. Gregory, *Robert Raikes, Journalist and Philanthropist* (London, 1877); J. H. Harris (ed.), *Robert Raikes: The Man and his Work* (New York, 1899). See Sunday Schools.

RAIL (OF. *raale, rasle,* Fr. *râle,* rail, rattling in the throat, from OF. *raller,* Fr. *râler,* to rattle in the throat, from MDutch *ratelen,* Ger. *rasseln,* to rattle; connected with Gk. *κραδαίνειν, kradainein,* to swing; so called from its cry). A bird of the subfamily Rallinæ, especially of the genus *Rallus,* related to the coots and gallinules and more remotely to the cranes. Rails have a slender bill, usually longer than the head, the body of a very compressed form, wings of moderate length, a short tail, long and strong legs, and long toes. The only European species is the common or water rail (*Rallus aquaticus*), which dwells in marshes and the reedy margins of lakes and rivers. It is generally a bird of passage, breeding in the north and migrating southward on the approach of winter. The bird is about 11½ inches long. The sexes are similar in plumage, olive brown marked with black above, bluish ash color beneath, with white transverse markings on the belly. The water rail feeds on worms, mollusks, and soft vegetable substances. It is in high esteem for the table.

In the United States six or seven species are known. The Virginia rail (*Rallus virginianus*) is numerous in many parts of the Eastern States, but is not often seen, because of its great shyness. It is rather smaller than the water rail of Europe, but much resembles it in appearance, haunts, and habits, which are those of the rails in general. (See Colored Plate of Game Birds accompanying article Grouse and also Colored Plate of Eggs of Game and Water Birds.) The king rail, or fresh-water marsh hen (*Rallus elegans*), is a much larger bird, inhabiting marshes throughout the eastern United States, while the clapper rail, or salt-water marsh hen (*Rallus crepitans*), is extremely abundant in the salt-water marshes of the Atlantic coast. Each of these is about 15 inches long, and both are shot in great numbers for the table, while their eggs also are regarded as a delicacy. The mangrove hen (*Rallus longirostris*) is a similar species of the West Indies, and a close ally (*Rallus obsoletus*) belongs to California. All these species are much alike in the compressed shape of the body, long bill, and large feet. The prevailing colors are olive, gray, fuscous, cinnamon brown, black, and white; the sides and under parts are handsomely barred. The name "rail" is often given to certain American coots and is universally extended to those raillike birds of the genus *Porzana* which inhabit drier lands and in England are called crakes (see Crake). The most abundant and best known of these is the sora, or Carolina rail (*Porzana carolina*), which is a favorite object of sport, with dogs, in the Southern States. Two other species, the yellow and the black rails, occur in eastern North America. The black is rare and noted for small size, dark color, and seclusive habits.

The rails form a highly generalized family, with a numerous fossil ancestry going back to the Eocene. They are distributed throughout the world, and many peculiar forms are or were inhabitants of the East Indian and South Sea islands. Many of these were restricted to one group or even to a single island, and had lost the use of their wings long before they became known to ornithologists; they were thus defenseless and several species have become extinct. Prominent examples are the genus *Notornis* of the New Zealand region and the strange little wingless rail of Tristan d'Acunha. Consult: Newton, *Dictionary of Birds* (New York, 1896); A. H. Evans, "Birds" in *Cambridge Natural History,* vol. ix (ib., 1900); and for the American species, H. K. Job, *Among the Water Fowl* (ib., 1902), and W. W. Cooke, "Distribution and Migration of North American Rails," in *United States Department of Agriculture, Bulletin No. 128* (Washington, 1914). See Extinct Animals; Flightless Birds; Weka; and Plate of Rails, etc.

RAILROAD, Underground. See Underground Railroad.

RAILROADS. See Railways.

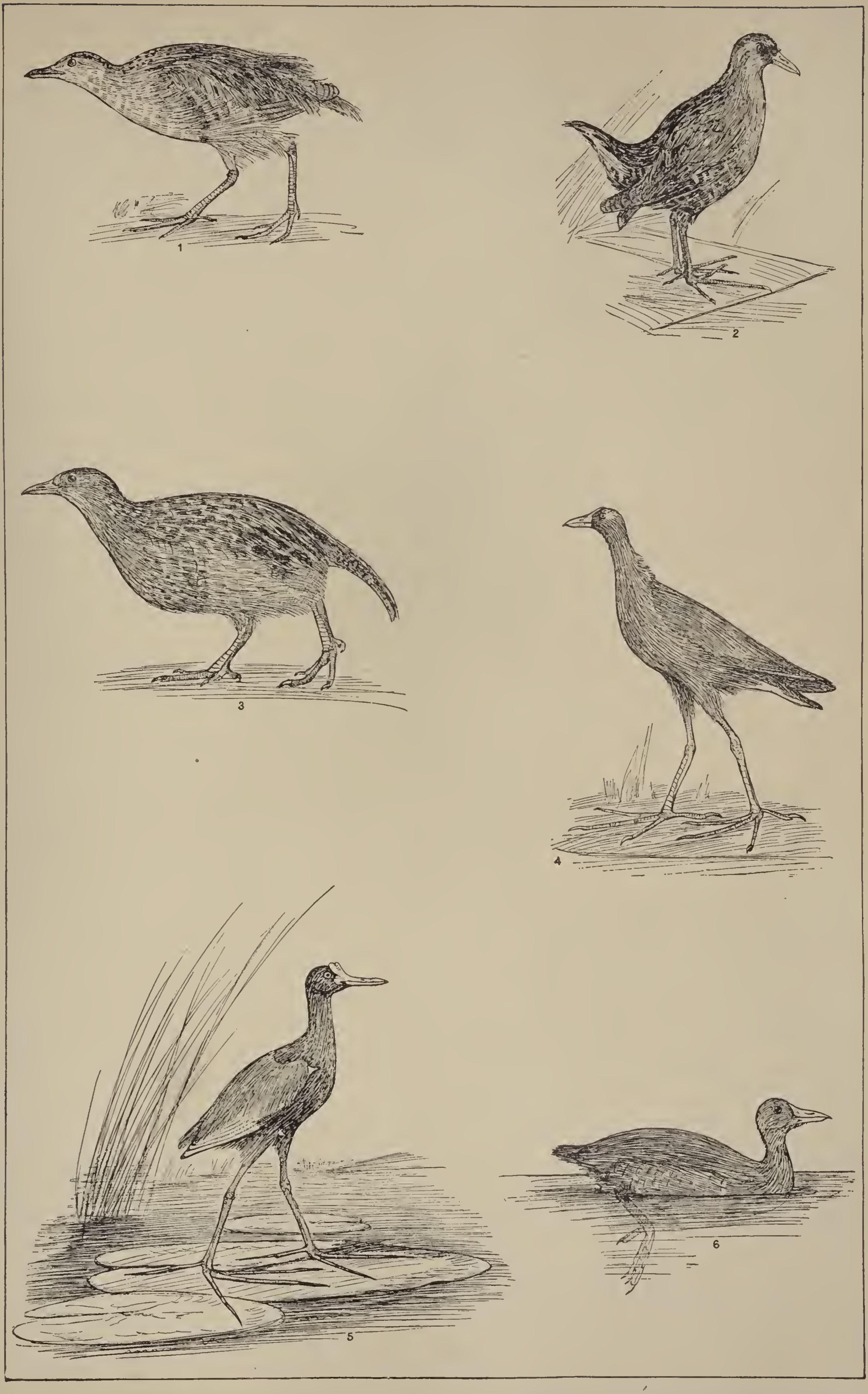
RAILROAD TELEGRAPHERS, Order of. See Railway Brotherhoods.

RAILROAD WORM. A popular name in New England for the apple maggot, the larva of a trypetid fly (*Trypeta pomonella*), given because it spread along the lines of the railroads. It is a native of the northern United States and Canada, extending south along the Appalachian Mountains. The larva is a footless maggot, which lives in the pulp of the apple and tunnels it with winding channels, making here and there discolored excavations about the size of a pea. When ready to transform the maggot leaves the apple, falls to the ground, and beneath the surface enters the pupal state, in which condition it remains until the middle of the following summer, when the perfect fly escapes. The fly is shining black, with a rust-red head and legs and whitish wings with dusky bands. The eggs are inserted into the flesh of the apple, and frequently fruit is attacked which has previously been perforated by the codling moth. Thin-skinned summer and fall apples are preferred by it to the winter varieties.

RAILWAY, Ship. See Ship Railway.

RAILWAY BEETLE. A curious beetle of the family Malacodermidæ and probably of the tribe Phengodini, the female of which is wormlike or larviform and is said to give out a strong red light from the two extremities and a green light from numerous points along the sides of the body, giving it the appearance of a miniature railway train. These beetles occur not infrequently in parts of South America, and the name originated apparently in Paraguay. In the United States very rare representatives of the genera *Phengodes* and *Zarhipis* have similar larviform luminous females. Cf. Luminosity of Animals.

RAILS, GALLINULES, AND JACANA



1. CORN CRAKE (Crex crex)
2. SORA or CAROLINA RAIL (Porzana Carolina).
3. WEKA or FLIGHTLESS RAIL (Ocydromus australis).
4. PURPLE GALLINULE (Ionornis Martinica).
5. JACANA (Jacana jacana).
6. AMERICAN COOT (Fulica Americana).

RAILWAY BROTHERHOODS. Organizations of railway employees for the protection of their interests and the advancement of their condition in so far as dependent on themselves. The Grand International Brotherhood of Locomotive Engineers (organized 1863), the Order of Railway Conductors of America (organized 1868), the Brotherhood of Locomotive Firemen (1873), the Brotherhood of Railway Trainmen (1883), and the Order of Railroad Telegraphers (1886) are commonly referred to in the trade-union world as the great railroad brotherhoods, and they are clearly distinguished from the other trade unions of the United States by unusual conservatism, a highly perfected form of government, and the great emphasis which they place upon the character of their members. While the railway brotherhoods are on an exceptionally friendly footing with the railway managers and have secured written contracts with most of the railroads fixing wages and other conditions of employment, they regard themselves as preëminently protective associations and each maintains a large protective or strike fund. They also differ from the ordinary American union in the importance which they attach to the feature of mutual insurance. Affiliated with each of the brotherhoods is a ladies' auxiliary society. These societies maintain, with assistance from the brotherhoods themselves, a joint home for aged and disabled railroad employees at Highland, Ill.

The railway brotherhoods are very similar in organization and government. The supreme powers are vested in a biennial national convention. The most striking feature which these brotherhoods have in common, however, is their system of legislative and adjustment boards. 1. The legislative board constitutes the lobby of the railway laborers. Whenever a majority of the divisions of any State or province so desire, their representatives assemble at the State or provincial capital and effect a general organization, usually selecting one or two delegates—the chairman and secretary-treasurer—as a permanent legislative committee. A plan has been devised by which the chairmen of the legislative boards of the several organizations may combine in a railroad brotherhoods' legislative board, and such boards exist in several States. 2. The boards of adjustment, also known as protective boards, are charged with the investigation of grievances and the collective bargaining concerning wages and other conditions of employment. In general each division or local union elects a local grievance committee or board of adjustment, and the chairmen of the local boards on each system of railways constitute a general board of adjustment for that system. Where two or more separate systems are controlled by a single syndicate, the Locomotive Engineers provide for a still higher board or executive committee of adjustment covering all the roads included in the syndicate. The adjustment system makes it extremely difficult to declare a strike. The local grievance committee, the general board of adjustment, and the chief executive officer must all attempt to settle the grievance by peaceable negotiations with the railroad officials before a proposal to strike may be considered, and then, in most of the brotherhoods, it must be indorsed by the chief executive, the board of adjustment, and two-thirds of the members who will be involved.

With the exception of the Telegraphers and the International Association of Car Workers, the railroad organizations are not affiliated with the American Federation of Labor, and, notwithstanding the essential similarity of their interests, the frequent attempts to create a general federation of railway employees have failed.

RAILWAY CONDUCTORS OF AMERICA, ORDER OF. See RAILWAY BROTHERHOODS.

RAILWAY HUMP YARD. See HUMP YARD, RAILWAY.

RAILWAY MAIL SERVICE. See RAILWAYS.

RAILWAYS. In its broadest use the word "railways" includes all roads which are used for the operation of vehicles on tracks by some form of motive power, be this motive power draft animals, a cable, some application of electricity, internal-combustion, or compressed-air motor, or the steam engine. In the present article, however, there will be considered only the railway which is operated by steam or electric locomotives for both freight and passenger service and such early forms of railways as were part of the development of the modern steam railway. Under separate headings will be found discussions of electric railways, both urban and interurban, cable railways, etc. A railway consists of the fixed plant and the rolling stock, which is usually called equipment and is used in connection with this plant to provide transportation for both passengers and freight.

EARLY HISTORY

The development of the steam railway is ordinarily dated from the opening to traffic of the Stockton and Darlington Railway, in England, in 1825. The railway, however, had a history long before this date. Indeed, the Stockton and Darlington Railway and its immediate successor, the Liverpool and Manchester Railway, were comparatively perfect developments of the art of railway transportation.

Early in the sixteenth century rails of timber were laid at the collieries near Newcastle-on-Tyne, England, over which by means of bulky carts provided with rollers one horse could draw four or five tons of coal. The first notable improvement of this crude railway consisted in securing these wooden rails by pegs to crossties placed 2 or 3 feet apart and in fastening on top of the rails proper, which were about 6 inches square, strips of hard wood which could be removed when worn and replaced with new strips without disturbing the remainder of the structure. In the year 1735 flat iron bars were substituted to some extent for this upper strip of wood, and in 1767 cast-iron bars were generally substituted for the entire wooden rail. At first these bars were flat and about 4 inches wide, 1¾ inches thick, and 4 or 5 feet long, with holes for the spikes; but after a few years they were made with a ridge along the outside edge to prevent the wheels from leaving the track. Subsequently the flange was transferred to the inside edge of the rail. In 1789 William Jessup introduced a new form of cast-iron rail in which the depth was greater than the width, which led to the name of edge rail being given to it. These rails were cast with a head 1¾ inches wide carried by a thin web deeper at the middle of the rail than at the ends. At first these rails were bolted or pinned directly to the ties, but soon afterward they were arranged to be supported by cast-iron pedestals or chairs spiked to the ties and having a slot at the top in which the web of the rail was set and secured by a wedge. The rails were made without flanges and instead flanges were placed on the wheels. Owing to the short lengths in which these rails had to be cast, the joints were numerous, a very important objection in railway track, and besides this the material was too brittle to carry safely heavy loads at high speed. The development of the iron industry partly remedied these faults about 1820 by furnishing malleable or wrought iron from which tough rails could be rolled up to lengths of 15 feet. At the end of the first quarter of the nineteenth century, therefore, the standard railway track consisted of wrought-iron edge rails about 15 feet long, fastened by keys into cast-iron chairs, which were in turn bolted down to stone blocks or wooden sills spaced about 3 feet apart. The gauge of the track, i.e., the distance apart of the rails measured between the inner edge of their heads, was 4 feet, 8½ inches, which ultimately became the standard gauge of railway track in England and America. There was at one time in the United States very bitter discussion of the relative merits of the narrow gauge, 2 feet, 8½ inches, and the standard gauge, 4 feet, 8½ inches. The result of this discussion, however, was the almost universal adoption of the standard gauge, although, as is shown in the table of mileage of railways in operation in the United States, there is a considerable mileage of narrow-gauge roads, mostly in mountainous country, in the United States. On some Western lines a third rail outside of the narrow-gauge track is laid at the standard distance so that rolling stock of both gauges may be used. In Russia for military reasons a gauge different from that of Germany was maintained, while in India and Australia many different gauges are employed, though in both the last-named countries and especially in connection with the Australian transcontinental railroad, progress towards a single gauge for the more important lines was being made.

It will be observed that the essential characteristics of the modern steam-railway track had been established by 1825 and that it only remained for future knowledge and experience to develop and perfect these features.

Development of Motive Power. The great advance of the wrought-iron edge rail over previous forms of rails gave the first strong impetus to the development of a means of motive power for railways which would be superior to haulage by horses. The possibility of using steam locomotives at once suggested itself. Steam carriages for operation on common roads had been constructed long previous to 1825. (See Automobile; Locomotive.) As early as 1804 Richard Trevithick had built a locomotive engine, which at its first trial upon the Merthyr and Tydvil Railway, in Wales, had hauled wagons containing 10 tons of coal at the rate of 5 miles per hour. In 1812 locomotives were used by Blenkinsop to haul coal between the Middleton collieries and Leeds, and also by Blackett at Wylam. None of these locomotives were satisfactory. In 1814 George Stephenson built his first engine and put it in operation on the Killingworth Railway, where it hauled a load of 35 tons at the rate of 4 miles per hour on a grade of 1 in 450. Stephenson continued to build locomotives, each of them an improvement over its predecessor, and had them working regularly on the Killingworth Railway, although they did not supersede the work of horses.

The next step in advance in the use of the locomotive was made on the historic Stockton and Darlington Railway, the construction of which marked the advent of a new era in railway transportation. Before passing from the early history of railways to this new era it will be interesting to summarize briefly the status of railway transportation at the time. In 1825 the existing railways of Great Britain were 28 in number, ranging in length from 4 to 35 miles and amounting in the aggregate to about 400 miles. These roads were used almost exclusively for the transportation of mineral products. With the few exceptions previously noted, the universal motive power employed was haulage by horses.

Period of Development. The Stockton and Darlington Railway, 25 miles long, was opened for traffic in 1825, the line having been constructed under the direction of George Stephenson as chief engineer. Considering Stephenson's previous work with steam locomotives on the Killingworth Railway, it was not surprising that he should attempt to use similar motive power on the new line. His success in the attempt was considerable. On the opening of the road the Stephenson engine hauled a train composed of 22 wagons filled with passengers and 12 wagons loaded with coal, making an aggregate weight of about 90 tons, at an average speed of 5 miles per hour and a maximum speed of 12 miles per hour. Notwithstanding the flattering showing made by the locomotive engine in this trial trip, that form of motive power was employed only to a small extent in the immediate future operation of the railway. It could not compete in economy with haulage by horses, and for some time all passengers and mixed freight were so hauled, the locomotive being used only to handle a portion of the coal traffic. The important rôle played by the Stockton and Darlington Railway, therefore, consisted less in any advance in the mechanical features of railway transportation than in establishing the possibility of the railway as a common carrier of passengers and freight. Railway transportation in the modern meaning of the term began, thus, with the Stockton and Darlington Railway.

The success of the Stockton and Darlington Railway revived another railway enterprise which was destined to accomplish more in some respects for railway engineering than did the earlier road. This enterprise was the project for a railway line between Liverpool and Manchester, a distance of 30 miles. Construction was begun upon the road in 1826, with George Stephenson as chief engineer. Considerable difference of opinion existed as to the best method of operating the road when completed. Stationary engines had many advocates, including some of the most noted engineers of the day; others were in favor of horse power aided by stationary engines at the steep inclines, but few had any faith in locomotives, and Stephenson stood practically alone in openly advocating their use. His persistent earnestness, however, influenced the board of directors to offer a prize of £500 for the best locomotive engine which on a certain day should be produced on the railway and perform certain specified duties in the most satisfactory manner. The date of the test was Oct. 1, 1829, and on this date four locomotives appeared to compete. One of these was the *Rocket*, built by Stephenson, and another was the *Novelty*, built by the Swedish engineer John Ericsson, afterward famous as the designer of the United States ironclad *Monitor*. The trials of these locomotives lasted until October 14, when the prize was awarded to Stephenson's locomotive, the *Rocket*, which undoubtedly ranks as the first high-speed locomotive of the modern type. (See LOCOMOTIVE for description.) The success of the *Rocket* determined the motive power for the Liverpool and Manchester Railway and incidentally for railways throughout the world. On Sept. 15, 1830, the Liverpool and Manchester Railway was opened for traffic and on December 4 of the same year the locomotive *Planet* hauled the first load of freight, consisting of 18 wagon loads of cotton, 200 barrels of flour, 63 sacks of oatmeal, and 34 sacks of malt, from Liverpool to Manchester in 2 hours and 39 minutes. As the model railway of its time the track construction of the Liverpool and Manchester Railway deserves some mention. Upon the graded surface was placed a layer of broken stone 2 feet deep. Stone blocks 2 feet square were set 3 feet apart, and upon them and upon the wooden crossties used on embankments were fastened cast-iron chairs in which the rails were secured by wedges. The rails were of wrought iron 15 feet long and were rolled with the web deeper at the middle than at the ends. They weighed 35 pounds per lineal yard.

TABLE I

RAILWAY MILEAGE OF THE PRINCIPAL COUNTRIES, 1913, SHOWING STATE OWNED AND PRIVATELY OWNED RAILWAY

(*From the Archiv für Eisenbahnwesen*)

COUNTRY	Total	Private	State
EUROPE			
Germany	39,831	2,998	36,833
Austria-Hungary	28,872	5,293	23,579
Great Britain	23,572	23,572	....
France	31,992	26,350	5,642
European Russia	38,873	14,167	24,706
Italy	11,021	1,878	9,143
Belgium	5,508	2,787	2,721
Luxemburg	328	205	123
Netherlands	2,035	915	1,120
Switzerland	3,039	1,328	1,711
Spain	9,593	9,593	....
Portugal	1,864	1,147	717
Denmark	2,356	1,132	1,224
Norway	1,932	288	1,644
Sweden	9,056	6,175	2,881
Servia	638	....	638
Rumania	2,351	133	2,218
Greece	1,005	1,005	....
Bulgaria	1,206	....	1,206
European Turkey	1,246	1,246	....
Malta, Jersey, Man	68	68	....
Total	216,396	100,285	116,111
AMERICA			
Canada	29,468	27,687	1,781
United States	256,823	256,823	....
Newfoundland	773	773	....
Mexico	15,932	3,509	12,423
Central America	2,016	1,655	361
Greater Antilles	3,425	3,275	150
Lesser Antilles	338	338	....
Colombia	625	515	110
Venezuela	637	569	68
British Guiana	104	104	....
Dutch Guiana	375	375	....
Ecuador	655	655	....
Peru	1,728	670	1,058
Bolivia	1,511	1,511	....
Brazil	15,615	8,849	6,766
Paraguay	233	233	....
Uruguay	1,648	1,648	....
Chile	3,981	1,988	1,993
Argentina	20,759	17,249	3,510
Total	356,317	328,094	28,223
ASIA			
Russian Central Asia Siberia	9,943	3,100	6,843
China	6,158	6,158	....
Japan, including Korea	6,866	1,968	4,898
British East Indies	34,850	4,362	29,488
Ceylon	606	606	....
Persia	33	33	....
Asia Minor, etc.	3,417	2,500	917
Portuguese Indies	51	51	....
Malay States	862	862	....
Dutch Indies	1,783	238	1,545
Siam	706	105	601
Cochin China, etc.	2,310	2,310	....
Total	67,591	23,298	44,292
AFRICA			
Egypt	3,716	790	2,926
Algiers and Tunis	3,988	2,175	1,813
Belgian Congo Colonies	868	868	....
South African Union:			
Cape Colony	3,999	548	3,451
Natal	1,109	...	1,109
Central South Africa	3,488	157	3,331
Rhodesia	2,420	2,420	....
Colonies—			
Germany:			
German East Africa	896	....	896
German Southwest Africa	1,315	....	1,315
Togo	204	....	204
Kamerun	193	...	193
England	2,368	1,047	1,321
France	2,011	2,011	....
Italy	96	96	....
Portugal	1,015	1,015	....
Total	27,693	11,129	16,564
AUSTRALASIA			
New Zealand	2,906	30	2,876
Victoria	3,693	25	3,668
New South Wales	4,120	167	3,953
South Australia	2,326	234	2,092
Queensland	4,845	296	4,549
Tasmania	705	196	509
Western Australia	3,449	579	2,870
Hawaii, etc.	88	88	....
Total	22,136	1,615	20,521
Grand total	690,133	464,421	225,711

In addition to establishing the practicability of the steam railway as a means of transportation for passengers and freight, the Liverpool and Manchester Railway proved the commercial value of such thoroughfares so satisfactorily that projects for railway lines sprang up all over the world. In Great Britain in 1840, 10 years after the opening of the Liverpool and Manchester Railway, there were 1331 miles of railway. These figures had increased to 6635 miles in 1850, to 10,410 miles in 1860, to 15,310 miles in 1870, to 17,935 miles in 1880, to 20,873 miles in 1890, and to 21,855 in 1900. In Austria the railway from Budweis to Linz, 80 miles, was begun in 1825 and 40 miles were completed in 1828; it was operated by horse power. In France the first railway, from Saint-Etienne to Andrézieur, 13 miles, was also completed in 1828. The first steam railway in Germany, that between

Nuremberg and Fürth, 4½ miles, was opened in 1835. For other foreign countries it must be sufficient to state the year in which the first important railway line was opened for traffic, as follows: Belgium, 1835; Germany, 1837; Russia, 1838; Netherlands, 1839; Italy, 1839; Switzerland, 1844; Denmark, 1844; Canada, 1847; Spain, 1848; Mexico, 1850; Sweden, 1851; Peru, 1851; Chile, 1852; India, 1853; Norway, 1853; Brazil, 1854; Portugal, 1854; Australia, 1855; Egypt, 1856; Turkey, 1860; Paraguay, 1863; Argentine Republic, 1864; Venezuela, 1866; Uruguay, 1869; Greece, 1869; Colombia, 1880. The articles relating to these countries give further details concerning the history of railway development in them, and the latest available statistics of mileage are summarized in the accompanying Table I.

The two earliest recorded railways in the United States were a short tramway on Beacon Street in Boston, built in 1807 with wooden rails, and a tramway, also with wooden rails, built by Thomas Lieper in 1809 in Delaware Co., Pa. These were followed by several tram roads of similar character, the most important of which was one in the town of Quincy, Mass. (q.v.), 3 miles long, and one at Mauch Chunk, Pa., 9 miles long, both built in 1827. These roads had a track consisting of an iron strap on wooden rails, supported by stone blocks or wooden sills, and were operated by horses. The first attempt made in the United States to use locomotive engines, otherwise than for mere experiment, was made on the railway from Carbondale to Honesdale, Pa., 16 miles, built by the Delaware and Hudson Canal Company. The *Stourbridge Lion*, a locomotive built in England, was placed upon the road in August, 1829.

The first charter for a railway granted in America was obtained by John Stevens, of New Jersey, in 1815 for a road to be built from the Delaware to the Raritan, but this project was never carried out. In 1830 construction was begun on the South Carolina Railroad, and the road was designed and built to be operated by steam locomotives. This was the first railway in America built with the purpose from the beginning of using steam locomotives. See LOCOMOTIVE.

TABLE II

SHOWING THE NUMBER OF MILES OF RAILWAY CONSTRUCTED AND IN OPERATION BY DECADES, IN THE UNITED STATES, FROM 1830 TO 1910 INCLUSIVE AND FOR 1913 *

(*From Interstate Commerce Commission Statistics of Railways*)

YEAR	Miles in operation
1830	23
1840	2,818
1850	9,021
1860	30,626
1870	52,922
1880	93,262
1890	166,654
1900	194,321
1910	240,439
1913	249,803

* Excluding Hawaii and Alaska.

The Baltimore and Ohio Railroad, commenced in 1828 and completed from Baltimore to Ellicott's Mills, Md., 15 miles, in 1830, came next in the use of steam locomotives. Indeed, in 1830 a small engine was built by Peter Cooper and made experimental trips on this road, but the first locomotive to be put in actual operation was installed in 1831. In 1831 the *De Witt Clinton*, a locomotive built by the West Point Foundry, was put into service on the Hudson and Mohawk Railroad. The next railway to mark a step in the development of the railway system of the United States was the Camden and Amboy Railroad, begun in 1831 and completed from Bordentown to South Amboy, N. J., 34 miles, in 1832. The president of this road, Col. Robert L. Stevens, conceived the idea that an all-iron rail would be preferable to the iron-strapped wooden rails employed on all previous American roads. There was no rolling mill in America capable of rolling such rails, however, and Mr. Stevens went to England to secure them. His request of the English ironmasters was for a rail having a head similar to that then in use upon the principal British roads, but with a wide flat base to the web, which he proposed to secure to the supporting blocks or sills by hook-headed spikes. Considerable difficulty was experienced in getting this request fulfilled, but in May, 1831, the first 500 rails, 15 feet long and weighing 36 pounds per yard, reached Philadelphia and were placed in the track, thus recording the first use of the flanged T rail, which has since become universal in America and is extensively employed abroad. It is important to note here that the flanged T rail was reinvented in England in 1836 by Mr. Charles B. Vignoles and that rails of this form are known abroad as Vignoles rails. Mr. Stevens invented the fishplates and the hook-headed spike.

TABLE III

SHOWING MILEAGE * OF VARIOUS CLASSES OF RAILWAY IN THE UNITED STATES ON JUNE 30, 1913

CLASS OF TRACK	Miles
Single track	244,418
Second track	26,271
Third track	2,589
Fourth track	1,964
Yard track and sidings	94,338
Total track	369,580

* Excludes companies earning less than $100,000 a year.

TABLE IV

SHOWING NUMBER OF EACH CLASS OF RAILWAY CARS IN OPERATION IN THE UNITED STATES ON JUNE 30, 1913

CLASS OF SERVICE	Number
Passenger	51,700
Freight	2,273,564
Company's	120,244
Total	2,445,508

RAILWAY LOCATION AND CONSTRUCTION

Surveys. The first consideration in the undertaking of building a railway is that of the economic necessity for the line. In the majority of cases American railways were built to develop the natural resources and to aid in the settlement of territory which was undeveloped and sparsely settled. On the other hand, in Europe and in Great Britain railways were built to supply a more efficient form of transportation than that already in use. In other words, the English railway was built to meet a need, while the American road was built to create a need which it could meet. This led to the fundamental difference in the theories on which American and European railways were built. The American idea until comparatively recently was to build a line as cheaply as possible and then gradually to rebuild it as the traffic which the road itself created justified more costly construction. The English and continental practice was to make the original construction of a permanent nature. The American practice was justified in early railway building in the United States and Canada, but it was more rather than less expensive in the long run than it would have been to build in the first place with higher standards.

Railway building naturally divides itself into new main-line and branch-line building. In either case the first consideration is as to the possibility of the development of sufficient traffic to support the new line. In main-line building enough traffic must be in sight to justify the entire cost. Branch lines, which act as feeders to the main line, may be built through territory that will not develop enough traffic to pay for their operation if a haul only as long as the branch line itself were to be considered. The character of the traffic which may be developed is the most important factor in determining the standards on which the line is to be built. After these standards have been determined preliminary surveys are made to form the basis of an estimate of the cost of obtaining the line with the standards which it has been decided the traffic will warrant. A few examples of what is meant will make this point clearer than would a considerable discussion of the theory. A 300-mile line is to be built which will open up timber land which in time will become agricultural land; there is some mineral land along the line and there are opportunities for the establishment of small manufacturing plants. Such a line, we will assume, can never hope to have either a very dense freight or passenger traffic or any very large quantity of low-grade freight which permits of heavy car loading. The traffic, therefore, would not necessitate the building of a line with easy grades at any heavy expense. Accordingly the surveys are made with the idea that wherever the nature of the country seems to require it 1 per cent grades will be adopted and six-degree curves. Possibly two or three preliminary surveys will be made to determine which is the best route using these standards.

Another line is to be built from the coal fields to two or three existing trunk lines. The territory to be traversed is capable of being developed into a rich manufacturing community and the coal itself assures a heavy freight traffic. The country may be very difficult for railway building, but the nature of the traffic which is to be developed demands that a line be laid out which shall have low grades and no sharp curves and which shall be capable of operation at a low ratio of expense to total earnings even when the rate received per ton per mile for the freight is low. Such a line must have its ruling grades five-tenths of 1 per cent, with nothing higher than four-degree curves. Here again preliminary surveys are made and estimates of the cost are submitted by the engineers.

Technically this preliminary work is known as engineering to distinguish it from construction. Until comparatively recently American railway engineers gave their attention to reducing construction costs so entirely that the cost of operation of the line became to them a secondary consideration. Recent railway construction has been carried on with more consideration for the costs of operation, not, however, always with success. The Atlanta, Birmingham, and Atlantic was built from Birmingham, Ala., to Charleston, S. C., with modern standards, low grades, permanent structures, heavy rail and ballast, but the character of the traffic which could be developed was not sufficient, at least immediately, to justify such character of construction and the company went into the hands of a receiver shortly after it began operation. On the other hand, the Carolina, Clinchfield, and Ohio, built from the West Virginia coal fields to a connection with the Norfolk and Western, Southern Railway, and Seaboard Air Line, was built through a very difficult country, maintaining a low grade, with structures throughout which permitted the use of the heaviest types of engines and cars. Apparently the traffic almost from the beginning justified this type of line, and although the rate received per ton per mile on this road is low, its expense of operation has been at a low ratio to its earnings. While it is true that the engineer does not generally decide the standards which shall be adopted, but can simply recommend these standards, he should have so thorough a knowledge of the economics of operation of a railway that he can avoid making a saving in construction costs at the expense of economical operation.

When the engineer has chosen his route and has selected a combination of grades and curves for this route, his next task is to establish its centre line on the ground with all the grades and curves properly indicated. In plan the centre line consists of a combination of straight lines or tangents and of curves. The curves may be simple curves, i.e., plain circular curves; or compound, i.e., consisting of two or more circular arcs of different radii; or reverse curves, i.e., two simple curves so joined as to form a curve like a flat letter S. Curves are further designated by their degrees of curvature. The degree of a curve is determined by the angle at the centre subtended by a chord 100 feet long. For example, if on any curve a chord 100 feet long subtends an angle of 5° at the centre, that curve is known as a five-degree curve. In profile the centre line is composed of a combination of level or horizontal lines and of inclined lines or grades ascending or descending from the horizontal. Grades are designated by stating the number of feet either of rise or fall in a horizontal length of line of 100 feet or of 1 mile. For example, a grade having a rise of 1 foot in a horizontal length of line of 100 feet is known as a 1 per cent grade. The same grade defined in terms of feet rise per mile of length would be known as a grade of 52.8 feet per mile. When two grade lines meet or when a grade line and a level meet, the junction is marked by an angle more or less abrupt. This angle is always replaced by a vertical curve which is convex upward at a summit and concave at a valley.

PERMANENT WAY

Roadbed Construction. After the line has been surveyed and decided upon, the next work after the right of way has been obtained is to begin excavating the cuts and making the fills. Wherever it is possible an attempt is made to use the material removed from cuts in making fills. There is, however, of course, a limit to the distance which this material can be hauled, beyond which limit it becomes cheaper to get material for fills especially for this purpose.

Making cuts and fills and grading generally are covered by the term "earthwork." Earth may be handled with plow and pick or plow, pick, and explosives for loosening, and moved with wheelbarrows, scrapers, or carts. Where the amount of work at a single cut or fill justifies it earth may also be loosened with explosives and handled with steam shovels. The American Railway Engineering Association classifies grading as between solid rock, loose rock, and common excavation, and defines each class as follows:

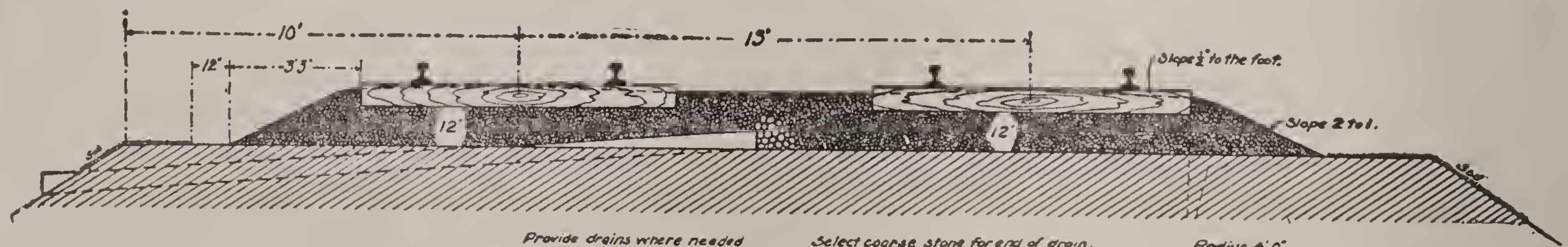
"Solid rock shall comprise rock in solid bed or masses in its original position which may best be moved by blasting, and bowlders or detached rock measuring 1 cubic yard or over.

"Loose rock shall comprise all detached masses of rock or stone of more than 1 cubic foot and less than 1 cubic yard, and all other rock which can be properly removed by pick and bar without blasting, although steam shovel and blasting may be resorted to on favorable occasions in order to facilitate the work.

"Common excavation shall comprise all other materials of whatsoever nature that do not come under the classification of solid rock, loose rock, or such other classification as may be established before the award of the contract."

A man with a pick will loosen from 15 to 30 yards of earth in a 10-hour day, depending on whether it is stiff clay or common loam. A two-horse team with a plow will loosen from 250 to 400 cubic yards in a 10-hour day. Steam shovels are usually operated by three men. It takes about 10 to 30 seconds to load a cubic yard by use of the steam shovel, depending, of course, on the nature of the material, the quickest material to load being iron ore and sand and the slowest rock. The capacity of steam shovels varies widely. The average for rockwork is 1 cubic yard, for earth and sand 1¼ cubic yards, and for clay and iron ore 1½ to 2⅓ cubic yards.

For standard gauge (4 feet, 8½ inches) the embankment for single track measures 14 feet at the top. The width of the base of the fill depends directly on the height and on the nature of the material used in making the fill. The standard slope for earthwork is 1½ to 1.



SECTION OF DOUBLE TRACK ROCK-BALLASTED EMBANKMENT, AMERICAN STANDARD PRACTICE.

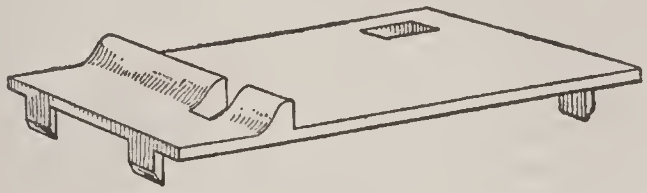
Bridges, Trestles, and Culverts. The type of bridges, trestles, and culverts that are to be adopted is in the first place dependent on the weight which is to be placed on them; secondly, as to whether or not they are to be permanent structures; and thirdly, on the nature of the opening which must be bridged. The standard for the heaviest locomotives and cars now in use on American railways requires bridges built for Cooper E-60 loading, i.e., the weight of two of the heaviest locomotives followed by a uniform weight of the heaviest cars, or about 6000 pounds per lineal foot. (See BRIDGE.) Permanent structures are now almost exclusively of steel and concrete.

Ballast. After the roadbed has been graded, the tunnels (see TUNNEL) driven and bridges and culverts made, the next step is to lay the ties, rails, and ballast. The principal materials that are used for ballast on American railways are stone, gravel, burnt clay (often called burnt gumbo), slag, cinders, and chats. The advantages of stone ballast are that it will stand up under the heaviest traffic, that it drains well, and that there is no dust from it. It is the most expensive ballast to maintain, and its original cost depends on the distance from a source of supply and the expense of excavation. It is generally considered that the so-called Sherman Hill disintegrated granite, which is not really rock ballast at all, which was found on the Union Pacific, is, from all points of view—cost of working, resistance to pulverizing, drainage, etc.—the best ballast that is used on American railways. Gravel is comparatively inexpensive to work, is often washed to free it from dust, and makes a comparatively easy riding roadbed; but even when washed is, compared to stone, dusty and does not give the rigid track under heavy traffic that stone ballast gives. It is in use on a greater mileage of American railways than any other form of ballast.

Burnt clay is quite extensively used in the southwestern United States, where neither gravel nor rock ballast is easily obtainable. A pit of clay is selected and a bed is made of alternate layers of clay and fuel and this bed is then burnt. The process takes a number of months, varying with the size of the bed, and the clay is then allowed to cool and is loaded on to cars with steam shovels. It makes a fairly good ballast, which does not drain as well as rock and pulverizes more easily, but is comparatively cheap to work under track. Slag is used for ballast where it is readily obtainable from furnaces. It makes a good roadbed, drains fairly well, but ordinarily pulverizes rather quickly and therefore has to be renewed frequently. Cinders makes the easiest-riding roadbed of all forms of ballast, but it is dusty, and quickly pulverizes. Chats, the waste product of ore concentration, is used as ballast in the Southwest.

Ties. Ties in the United States and Canada are generally of wood, although the Bessemer and Lake Erie uses a steel tie almost exclusively and a number of other roads have at various times experimented with steel ties. Steel ties are employed in Germany and in other continental countries. The difficulty in developing a steel tie for use on North American roads is, in the first place, that wood is cheap and that it admirably performs the function for which the tie is intended: it gives sufficient elasticity to permit the rail to take a natural curve under the moving wheel and when properly embedded in good ballast gives all the rigidity of alignment and surface that is required. Steel ties are in general far more rigid and less elastic than wooden ties and have the further difficulty of having to be fastened in some rigid way to the rail.

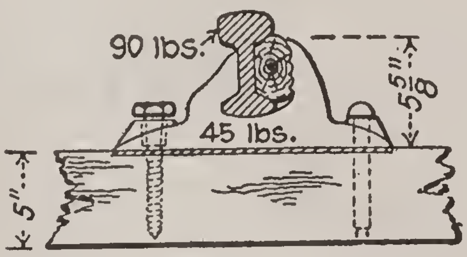
Various kinds of hard wood are used for ties, white oak being one of the best. Hard pine is in common use. Soft woods are used for ties, but are not desirable for a road with heavy traffic and are usually protected by a tie plate and treated with preservative. A great many American roads are now using treated ties. There are various treating processes, the most common being creosoting and burnettizing. The creosoting process consists of impregnating the tie with a mixture consisting largely of creosote. The tie is first subjected to a vacuum process and creosote is then forced into the pores under pressure. Burnettizing consists of impregnating the tie with a zinc solution. The cost of untreated ties varies from 40 cents for a pine tie in the southeastern part of the United States to $1.50 for an oak tie delivered in Arizona or New Mexico. Many American railways have started the preservation of certain tracts of timber along their route to provide for the future supply of ties at a reasonable price. Creosoting adds from 30 to 50 cents to the cost of a tie and burnettizing about 15 cents. The life of a tie depends on the weather conditions and the character of the traffic. A pine tie under a traffic density (see *Railway Operation*) of 500,000 tons one mile per mile of track in a moderately dry climate will last about seven years. A creosoted tie protected with tie plates will last, it is estimated, about 15 years, which is slightly longer than the life that is ordinarily given to a white-oak tie.



TIE PLATE.

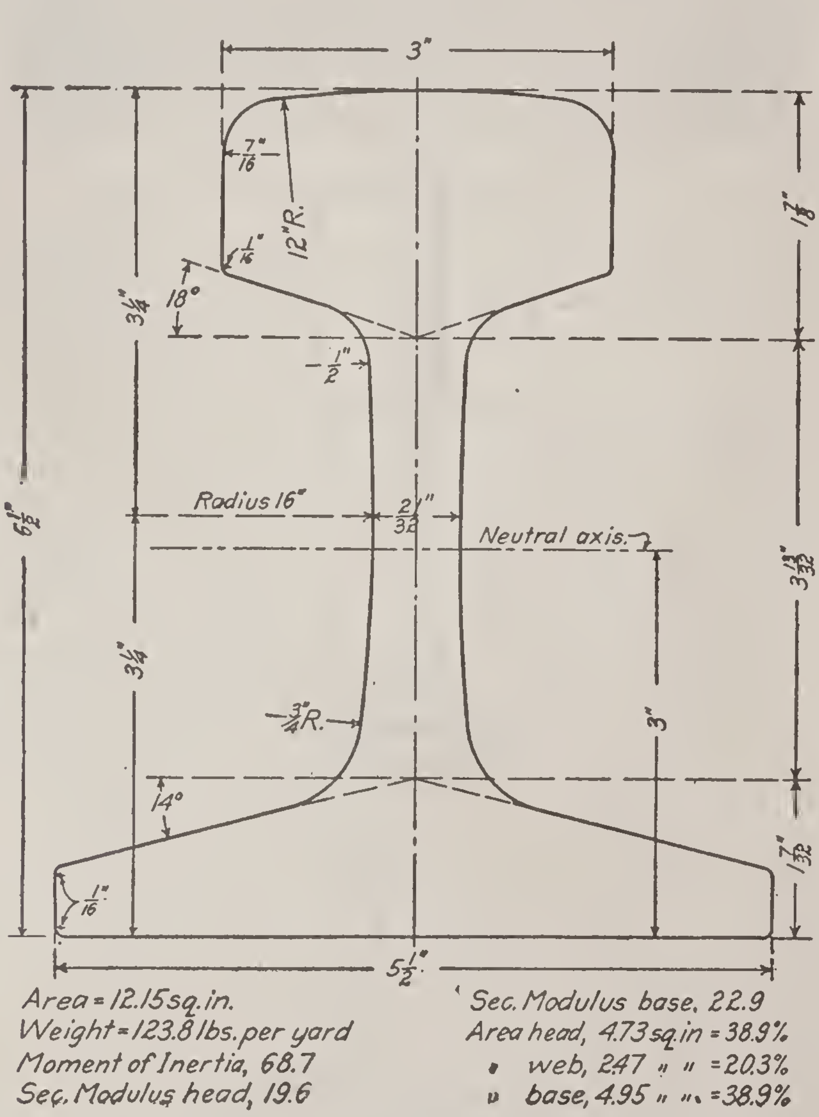
Ties are generally from 7 to 10 inches wide, 6 inches thick, and 8 to 9 feet long, and they are spaced from 18 inches to 2 feet apart in the track. An immense amount of timber is consumed annually for railway ties, as a brief estimate will demonstrate. Assuming that 2500 ties per mile of track are employed on the average, then the 250,000 miles of railway track in the United States require 625,000,000 ties. The annual consumption is about 76,000,000 ties for renewals and 14,000,000 ties for new construction, a total of 90,000,000 ties, or nearly 300,000,000 cubic feet of timber.

Rails. For a description of the metallurgical and other processes involved in manufacturing rails, see Iron and Steel; Rolling Mill. The T-section rail, invented by Col. R. L. Stevens in 1830, is in universal use in the United States and Canada, although the so-called bullheaded rail, shown in the accompanying illustration, is used in England. Rails are generally 30 feet long and are classified according to the weight in pounds per yard. On branch lines and on lines on which there is a small traffic density with light locomotives and cars, 65 and 70 pound rail is in use, but on the great majority of main-line American railways 85 or 90 pound rail is now the standard, with which lighter rail is replaced as it wears out. On roads of very heavy traffic, such as the main line of the Pennsylvania, the New York Central, the New York, New Haven, and Hartford, etc., a 100-pound rail generally has been standard, and rails on curves often have some alloy such as titanium. The Pennsylvania in 1914 began the use of a 125-pound rail. Manganese rails are being experimented with for use on curves, as the rail wear there is very much greater than on tangent track.



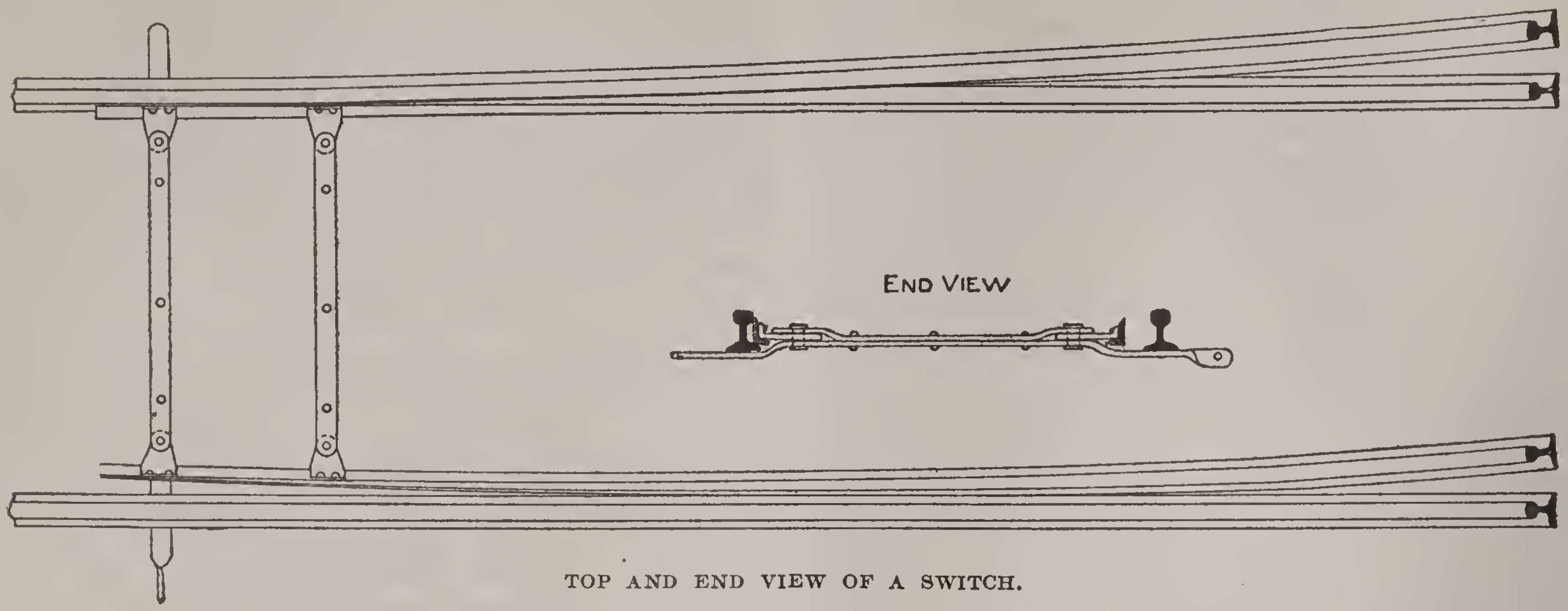
ENGLISH BULLHEAD RAIL AND CHAIR.

The distance apart of the rails is the gauge. The standard gauge, as has already been mentioned, in America, England, and most European countries is 4 feet, 8½ inches, or approximately the equivalent in meters. In England the rail is held in a chair, which chair rests on the ties or sleepers, as they are called there. In North America the base of the rail rests either directly on the tie or on a tie plate, and the rail is held in line by spikes driven into the tie. The object of this spike is not to hold the rail from moving vertically, but to keep it from moving laterally. The three parts of the rail are the head, the web, and the base. A cross section of a 125-pound rail of the Pennsylvania standard is shown in the accompanying drawing.

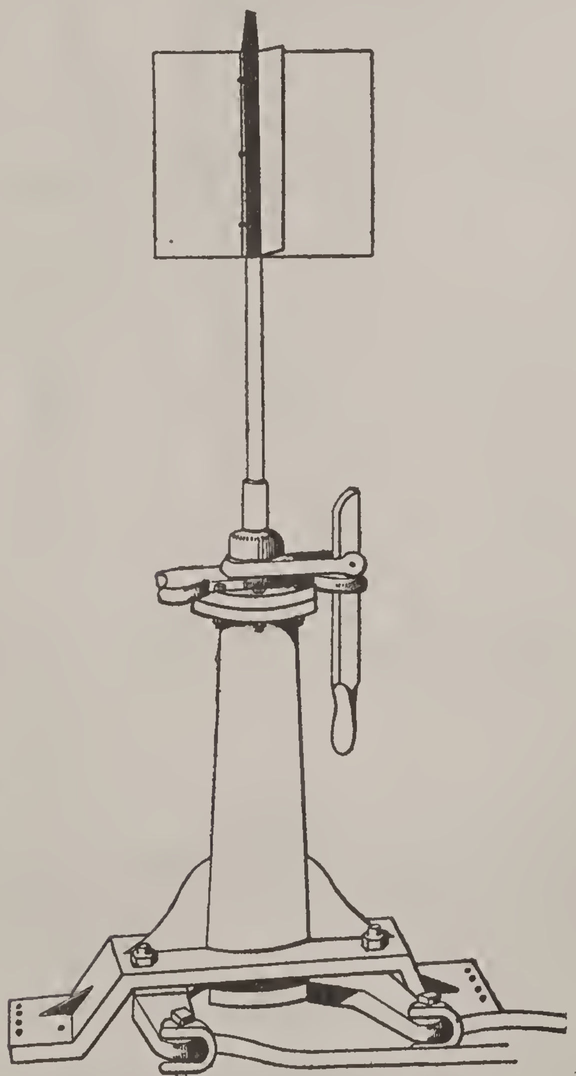


PENNSYLVANIA 125-POUND RAIL, SECTION.

Frogs and Switches. A switch is a device for directing the wheels of a train from one track to another. The switch itself consists of the frog and so much of the track as is connected with the device for turning the train from one track to the other, together with the switch stand and its accompanying levers, etc. The two switches and track connecting parallel tracks by which a train can be sent from one track over on to the other track are known as a crossover. The sharpness of this crossover is determined by the angle of the frog to the main track. The shortest crossover in general use on main track is what is known as a No. 8, the angle being 7° 10′; the longest is No. 2, with an angle 4° 46′, on which a train can go from one main track to another at a speed of from 25 to 30 miles an hour.

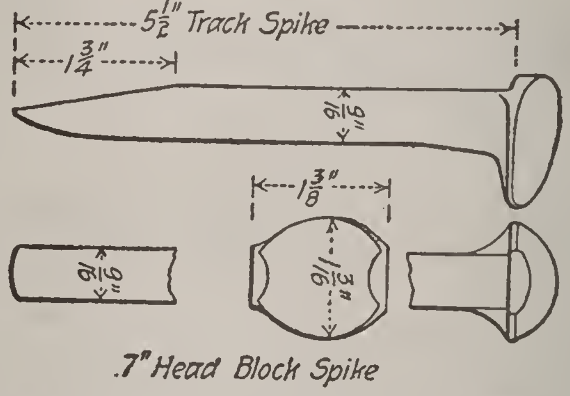


TOP AND END VIEW OF A SWITCH.



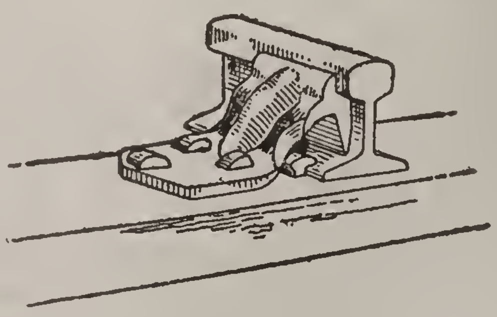
SWITCH STAND.

Track Fastenings and Appurtenances. The rail is fastened to the tie with a spike the head of which projects over the base of the rail. This may be either a smooth spike driven into the tie or a screw. With the screw spike a hole slightly smaller than the spike is generally bored in the tie and the spike is screwed into it. For boring this hole there are various machines, some of which necessitate the boring of a hole before the tie is laid; others, being worked by hand, bore the hole after the tie is in place. On tangent track with hardwood ties one spike is usually driven on either side of the rail in each tie. This is true also if tie plates are used. On curves when tie plates are used—and it is now considered good practice to use tie plates on all curves of more than four degrees—two spikes are almost always driven on the outside of the rail, and practice varies as to whether one or two spikes are driven on the inside of the rail. A tie plate is a flat or corrugated piece of metal with four holes through which the spikes are driven. The tie plate is placed between the rail and the tie. Some tie plates have ribs or other projections on the underside which bite into the tie, and nearly all designs of tie plates have a shoulder which engages the base of the rail on the outer side.



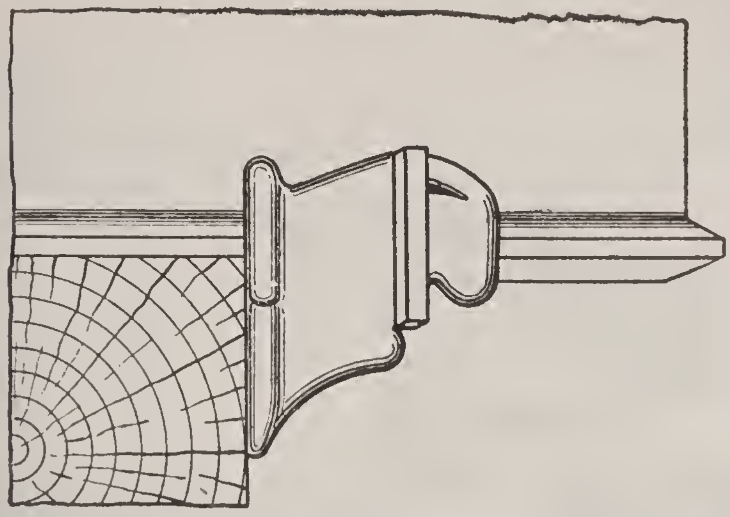
SPIKES FOR FASTENING RAIL TO CROSSTIE.

The tie plate preserves the tie, distributing the wear over a broader surface than the surface of the base of the rail, preventing the cutting of the tie by the rail, and helps to hold the rail in line by making the spike more effective. It is this latter function which has made the use of tie plates on curves of over four degrees general practice. With a soft-wood tie a tie plate is almost a necessity. With a hardwood tie there is difference of opinion as to how much its use on tangent track adds to the life of the tie, as there is also difference of opinion as to whether or not the projections on the underside of the tie plate by cutting into the fibre of the wood tend to make decay more rapid. In addition



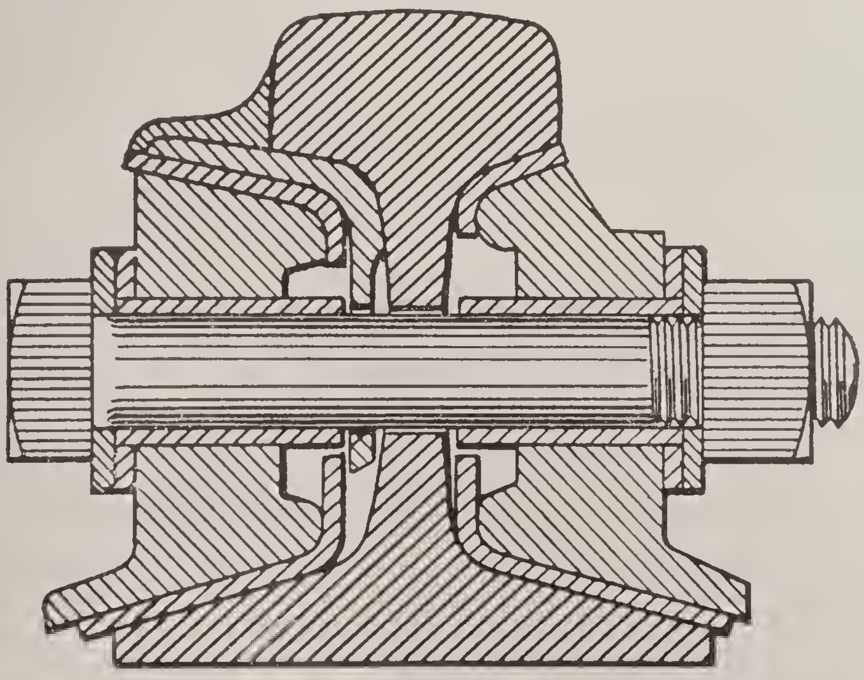
RAIL BRACE FOR HOLDING RAILS ON CURVES.

to the spike and tie plate to keep the rail in line, there are also various types of rail brace for use on curves. Such a brace is shown in the accompanying drawing. On a double-track railway where all traffic on one track is in the same direction, rails have a tendency to creep, owing to the undulating motion caused by the passage of the wheels. To prevent this creeping there are various rail anchors in use, one of which is shown herewith, the principle of most of these rail anchors being that the creeping tendency is prevented by the reflex action of the anchor pressing against the tie.



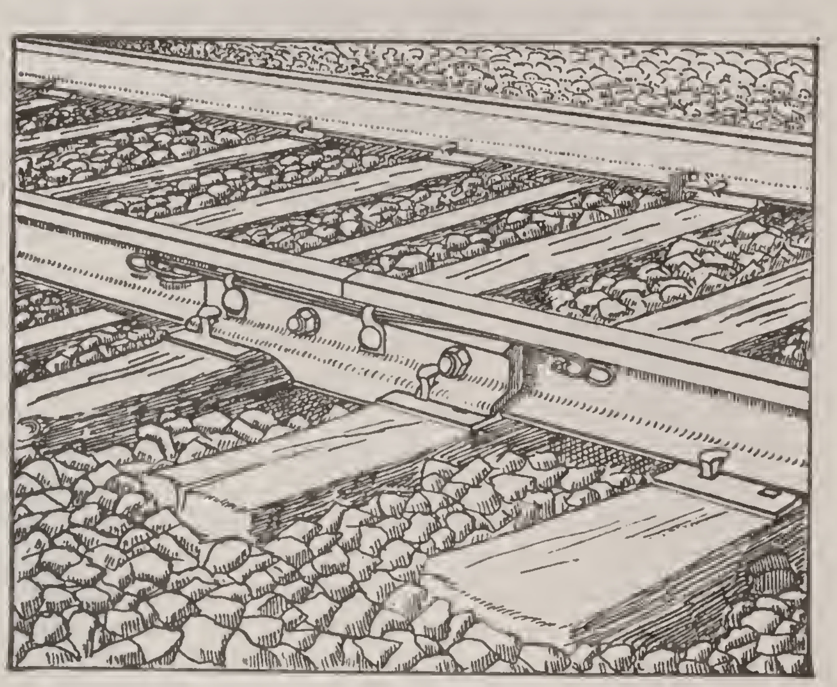
RAIL ANCHOR.

In the early stages of railway development rails were joined by a simple fishplate or bar of metal bolted through the web of the rail. This left the joint much the weakest part of the track. To overcome this various rail joints were devised, the idea being to support not only the web but also the head or the base, or both head and base, of the two rails, and when sufficient metal is put into the rail joint the joint is almost, if not quite, as strong as the rest of the rail length. Some railways have their own standard joint, while others use joints designed by manufacturing concerns. The accompanying illustrations show a side view of a rail joint in track and a cross section of an insulated joint. The American Railway Engineering Association has the following general requirements for a rail joint: it should connect the rails into a uniform continuous girder; it should be strong enough to resist deformation or permanent set; it should prevent deflection or vertical movement of the ends of the rails and permit movement for expansion; it should be as simple and of as few parts as possible to be effective; and its cost should not be prohibitive.



CROSS SECTION OF AN INSULATED RAIL JOINT.

When the type of construction is such that the joint comes between two ties it is known as a suspended joint, and when the joint comes squarely on top of a tie it is known as a supported joint. Suspended joints are considered rather the better standard, although there is considerable difference of opinion among railway engineers on this point, and the Lake Shore and Michigan Southern is an example of a road with the highest American standards using the supported joint.



PENNSYLVANIA RAILWAY STANDARD RAIL JOINT.

Track Laying and Surfacing. Before actual track laying is begun the subgrade is surfaced and drainage is provided for. Where the track is on grade it may be necessary only to ditch along each side of the shoulder of the subgrade. Where, however, the track is laid on level roadbed, ditches have to be dug so as to carry the water to the channel below grade. This may require a gradually deepening ditch to procure the proper slope or it may be necessary to drain into the cut and enlarge one of the side ditches. Slopes are often protected by sowing grass on them or even by sodding. Sometimes, however, it is necessary to pierce slopes with drainage pipes and to make subdrains of tiles.

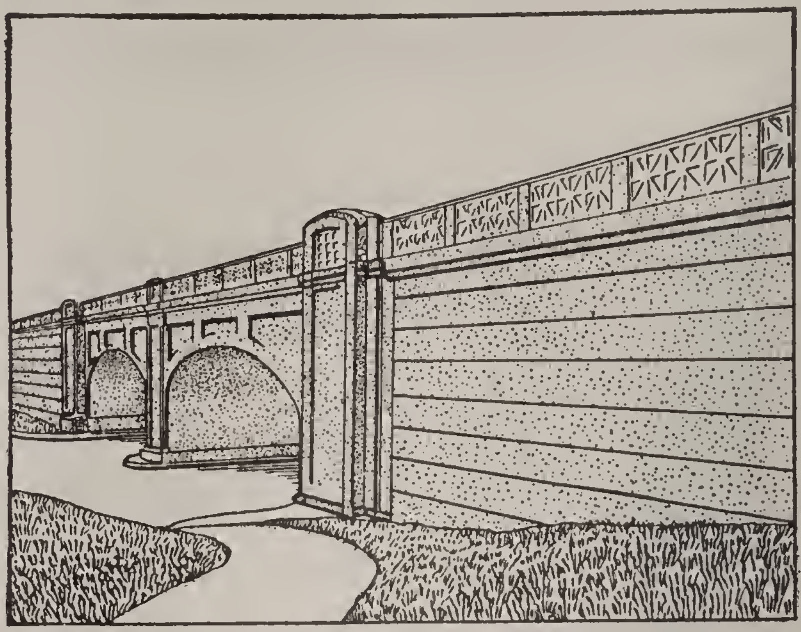
The material for the track may be either hauled by wagons and dumped at intervals along the right of way or the materials may be carried on a supply train and by means of machinery run forward on this train and track laid at the head of the supply train, so that by keeping the front car up to the last rail joint, ties, rails, and fastenings are unloaded at the proper point for use. In other cases the force doing the track laying is divided so that ties are laid and spaced ahead of the gang which is placing the rail on the ties, and the rail-laying gang is followed by one which spikes the rails. In laying rails each is carried forward until the rear end can be placed between the loose angle bars of the rail already placed. It is then pushed back to place, aligned, half bolted, and partially spiked to gauge. The rail is sometimes held by a clamp gauge and the spiking all done behind the rail car. Camp, in his work on *Track*, estimates that where track is laid without the use of machinery 56 laborers, 3 foremen, and 11 teams with drivers should lay a mile of track in 10 hours.

There are various machines used for track laying with the object of saving labor costs. With track-laying machines the ties and the rail, with angle bars attached, are brought to the forward car from the supply cars of the construction train. By some form of conveyer the ties are carried over a trestle projecting a rail length in advance of the car and delivered where they can be placed without disturbing the rail men. Each rail is carried forward and lowered so that it can be guided to a position in front of the splice bars of the rail in place and then pushed back by hand and spiked or otherwise temporarily held in place. It is estimated that about 2 miles per day can be laid with the more modern of these machines with 1 foreman, 4 men to operate the machine, 6 men to space ties, and 17 additional laborers. After the skeleton track is laid ballast is brought in and dumped on top of the ties. The track is then jacked up, aligned, and tamped to surface. Even with the rock ballast, however, new track sinks unevenly, and for the first year or more tamping to surface has to be done at frequent intervals.

Surface and alignment are the two objective points of good track. Alignment is defined by the American Railway Engineering Association as the horizontal location of a railway with reference to curves and tangents; surface, as the condition of track as to vertical evenness or smoothness over short distances. It must be remembered that alignment is obtained primarily by proper spiking and that surface is obtained by the proper tamping of the ballast under the ties.

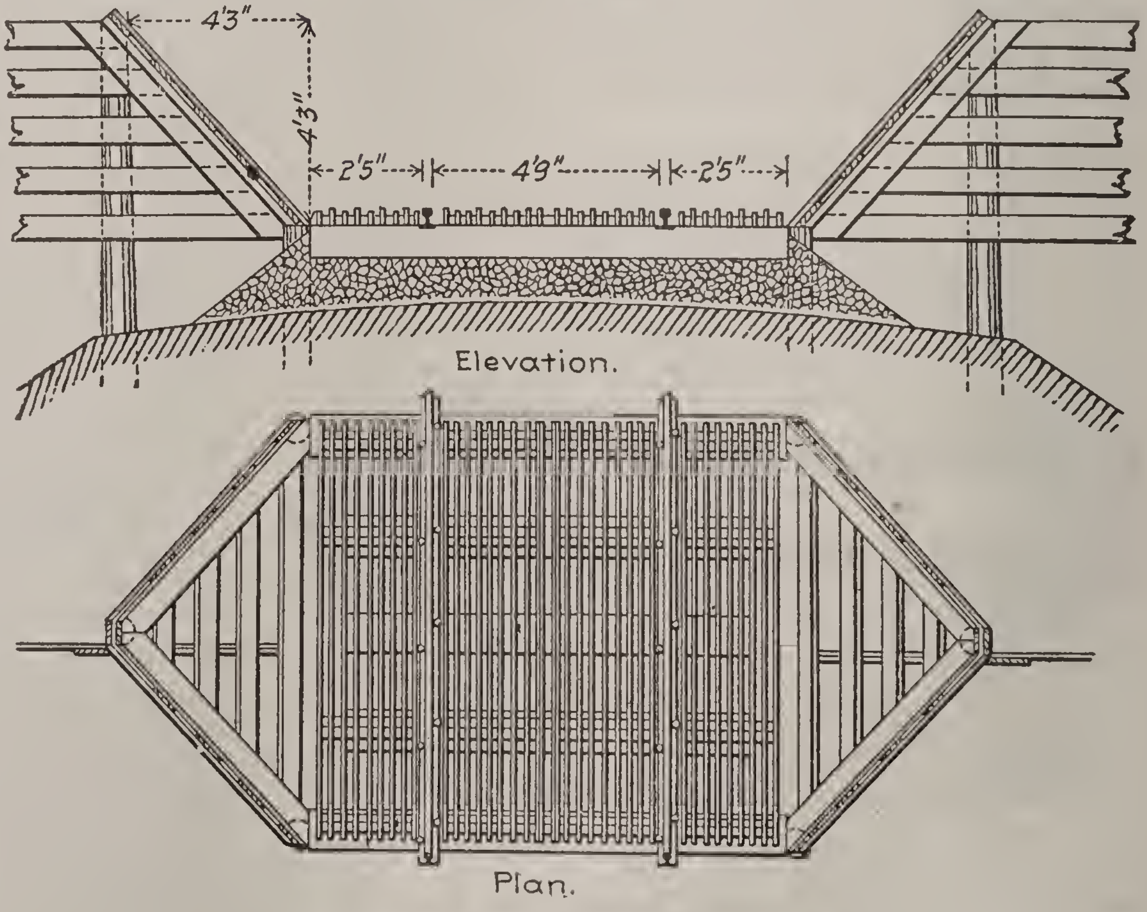
Roadway Machinery and Tools. The principal roadway tools that are peculiar to railway work as distinguished from highways are ballast forks, the ballast being cleaned by the use of a fork rather than a shovel; tamping bars, which are generally somewhat lighter than the ordinary crowbar, but of much the same shape; tamping picks, which have a hammer face on one end of the head; jacks for raising the track when tamping ballast under it; gauges, of wood or steel; hand cars or motor cars, used for section gangs (motor cars are now being introduced quite extensively on American railroads and are generally either gasoline or gas-electric motors fitted on a light car); rail benders; rail tongs, for handling the rail; and track levels.

Crossings, Fences, and Snowsheds. Crossings may be divided as between crossings of a railroad with a highway and crossings of one railroad with another. Crossings with highways were usually on grade in America until comparatively recently. In England and on the continent of Europe crossings at grade between railroads and highways were very seldom made, even in the early history of railroad construction. As the crossing with a highway has to conform with some paving, treated ties and stone ballast are usually employed and the paving is limited by the top of the rail on the outside and by the filler between the tracks, about ¼ inch low on the inside. Where no paving is required plank is usually laid alongside the rail on both inside and outside, with its surface about ¼ inch below the top of the rail.



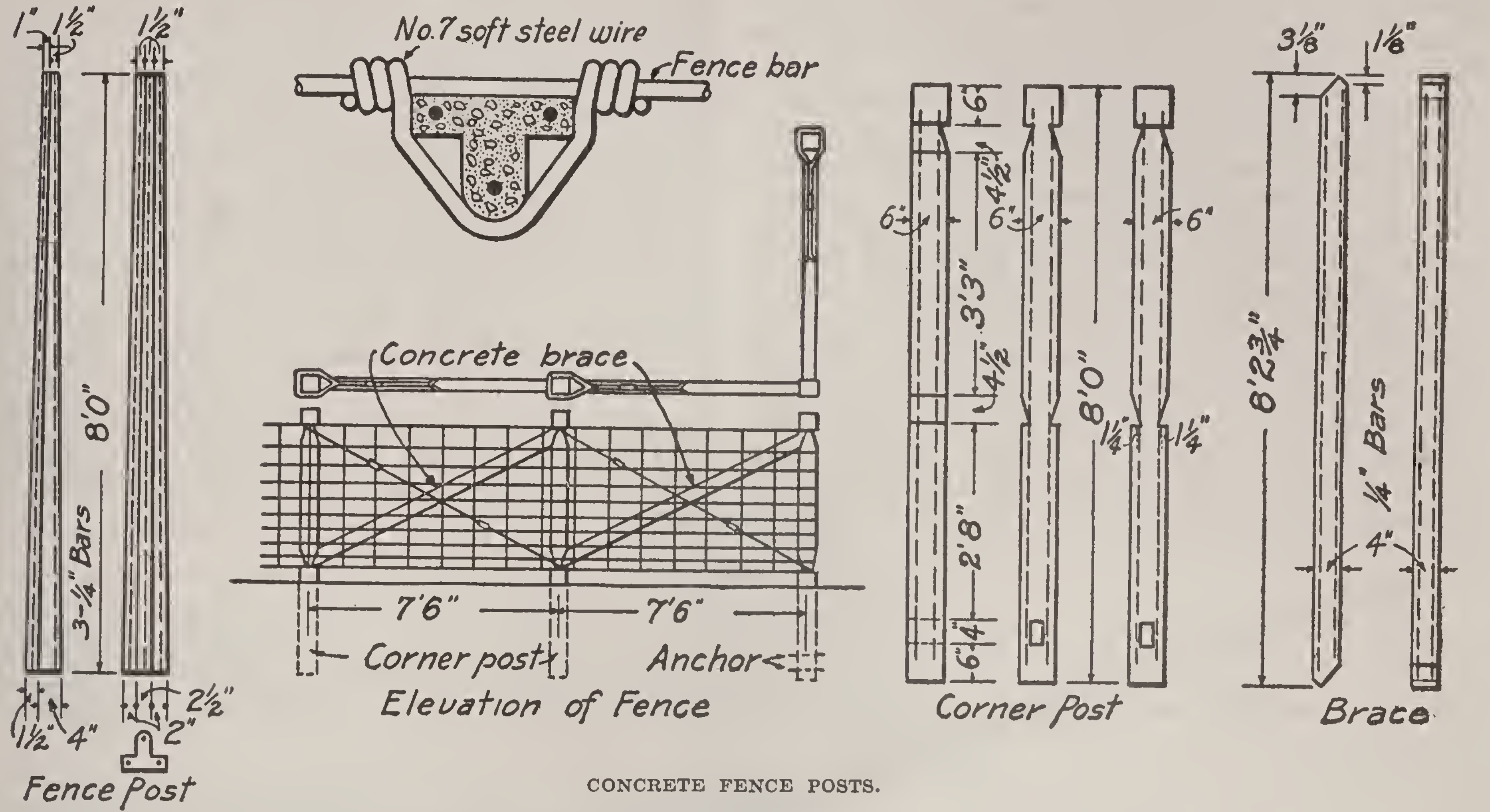
CONCRETE OVERHEAD CROSSING.

Many States have passed laws requiring the elimination of grade crossings in cities of a certain size, and the work of grade-crossing elimination is sometimes paid for in part by the State, town or city, and the remainder is paid by the railroad company. The highway may either be sunk so as to cross underneath the railroad track or raised so as to cross on an overhead bridge. A modern example of a concrete overhead crossing is shown in the accompanying illustration. Crossings at grade with other railroad lines are usually protected with interlocking switches and signals on railroads where there is any great density of traffic.



CATTLE GUARD WITH METAL SURFACE.

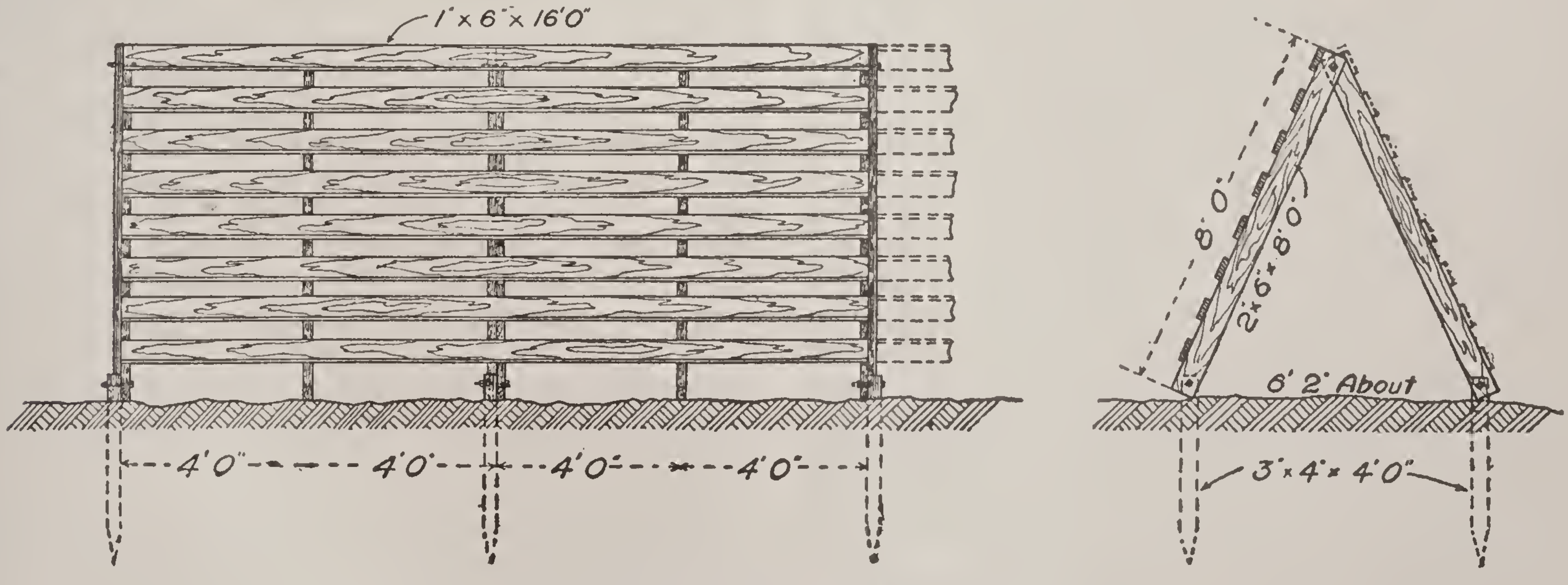
Cattle guards may properly be classed with crossings, fences, etc., and are of various designs, the simplest being an open pit with ties omitted and rails supported directly on stringers. This effectively prevents cattle from wandering down the right of way, but is dangerous to employees walking on the track at night, and a derailment at such a place is likely to be serious. Ties are sometimes placed in such pits with their upper side between the rails hewed to a narrow peak. Surface cattle guards, however, are generally considered better practice than the pit cattle guard, and such guards are made generally either of wood or of metal slats placed between the rails, as is shown in the accompanying illustration. Wooden cattle guards cost in the neighborhood of $25 and metal ones somewhat more.



CONCRETE FENCE POSTS.

The railroad company is usually required by law to build and maintain fences along both sides of its right of way. A post-and-wire fence is now the most common design used by railroads, the wire being either barbed or smooth, smooth being considered the better practice. The posts are usually of wood, but there are some forms of metal post in use, and in recent construction a post made of concrete, such as may be seen in the accompanying illustration, is being used.

In many parts of America it is necessary to protect certain stretches of track from heavy snowstorms, especially where the track is in a cut. In some cases a permanent board fence from 5 to 10 feet high is built on the right of way. Where the fence is placed more than 50 feet from the centre of the track, space is provided between the boards, and the snow collects on the under or leeward side of the fence; where the fence is nearer than 50 feet to the centre of the track, the boards are laid solid and the snow collects on the outward or windward side of the fence. Such a fence must be sufficiently strong to resist the pressure of snow and high winds. In the majority of cases where snow fences are necessary in America, portable fences are found more practicable than permanent ones. In certain localities and under certain conditions the use of three or four lines of portable snow fence, set parallel and spaced about 100 feet apart, is required. Snowsheds are necessary in mountainous country to protect the track from snowslides. Wooden snowsheds used to be almost universal. The American Railway Engineering Association recommends that railroads, if possible, should be so located as to make snowsheds unnecessary, that their use should be confined to localities which require protection from mountain snowslides, and that they should be built of permanent material.

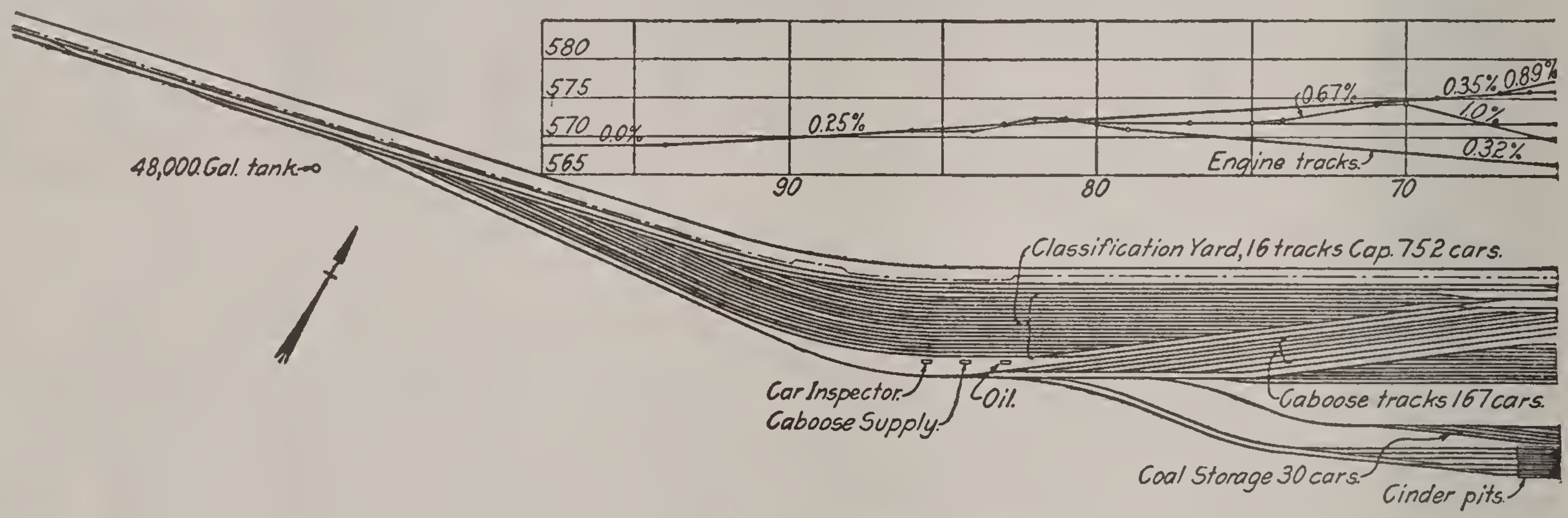


PORTABLE SNOW FENCE.

Signals and Interlocking. See special article on BLOCK-SIGNAL SYSTEM.

RAILWAY BUILDINGS

Terminals and Freight Houses. Freight houses are usually classed as inbound-freight houses, outbound-freight houses, and freight-transfer stations. Inbound-freight houses are those which provide for the delivery of freight from the railroad to the consignee; outbound-freight houses for the delivery of freight by the consignor to the railroad; and freight-transfer stations, where the necessity exists for consolidation or separation of shipments. The problem of handling both inbound and outbound freight and freight-transfer stations is one which has received a great deal of attention because the cost of this service is such a large proportion of the total cost of handling the traffic. The most universally used method of handling less than carload (L. C. L.) shipments—package and merchandise freight as it is usually called—is by means of hand trucks. Where the distance from the point of delivery of the freight to its destination is considerable, electric trucks are in use in some freight houses. These electric trucks can of course carry many times the load that a man with a hand truck can move, but, on the other hand, require additional men besides the man managing the truck to load and unload it, and cannot so easily be run into a box car for picking up or laying down packages. Different types of telpherage systems have been experimented with for handling package freight, but none of them has proved entirely satisfactory under general conditions where the variety of packages handled is great. The most extensive installation of a telpherage system for handling package freight at an inbound and outbound freight house was that of the St. Louis freight house of the Missouri, Kansas, and Texas. In this installation the telpher was operated by electricity on an overhead rail and picked up the truck loaded with package freight and moved it to the desired point, each telpher being operated by a man riding on the telpher itself. This system, however, was abandoned and hand trucks substituted.



PLAN AND PROFILE OF A HUMP YARD.

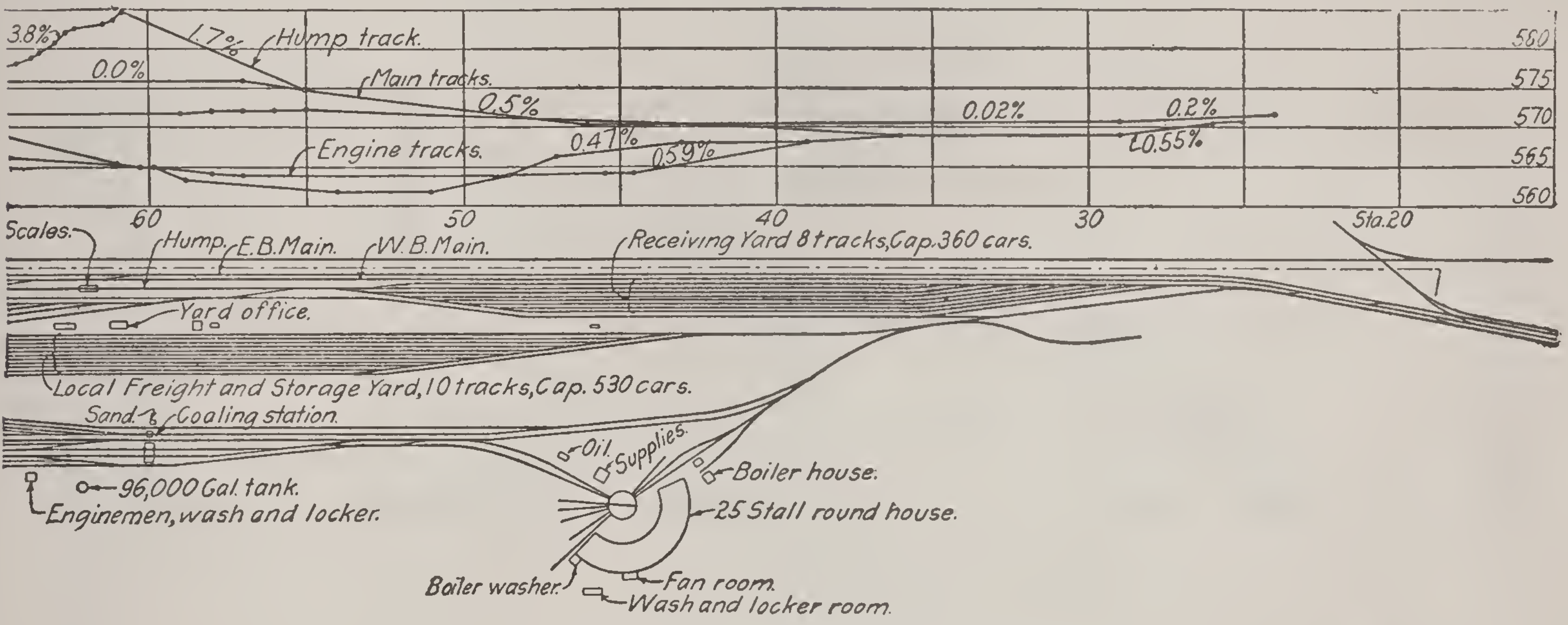
It is estimated that it costs from 25 cents to 50 cents per ton to handle either inbound or outbound package freight at a freight house, the difference in cost being accounted for in part by differences in the availability and price of labor and in part by the nature of the service required and character of freight handled.

Shops and Roundhouses. Railroad shops for the repair of locomotives and cars are not greatly different from manufacturing plants, and as a matter of fact many railroads not only repair their locomotives and cars but build a portion of their equipment. Roughly speaking one general repair shop is sufficient for a road of less than 800 miles. If the road is a busy one there will also be shops at division terminals for light and running repairs. Roundhouses are used for the storage of engines when not in use and for cleaning out the fire boxes, washing boilers, etc. They consist of an outer circular wall with a roof providing for ventilation, and at the entrance have a turntable by means of which a locomotive can be shunted on to any one of the tracks which end against the circular wall. Each of these tracks is known as a stall, and a roundhouse is generally spoken of as having 10 stalls, 20 stalls, etc., meaning that it has accommodation for 10 or 20 locomotives. Sheds for electric locomotives are provided with pits for the inspection and repair of the running gear and are usually long rather than circular in shape.

Fuel Stations. The fuel used on the great majority of roads in the United States and Canada is coal, although in the West and Southwest, especially in Texas and California, there are a large number of oil-burning locomotives in all classes of railway service. The simplest form of fuel station is a trestle, on which a coal car can be shoved, with one or more chutes which project over the track and into which coal can be dumped and so conveyed to the tender of the locomotive. Usually the fuel station has pockets in which coal can be stored, thus releasing the car in which the coal was brought to the trestle. The most modern fuel stations, such as those now in use on the Pennsylvania Railroad, have an elevator arrangement by which the coal is conveyed from the car into pockets, doing away with the necessity for a trestle. These fuel stations extend over two or more tracks, and all the work incident to elevating the coal and to opening and closing the chute, etc., is performed by machinery.

Water Stations. Water for the locomotive-tender tank which supplies the boiler is stored for immediate use either in tanks raised above the level of the top of the tender tank, so that water will flow into the tender by gravity, or in tanks on the ground level or below it, from which water is pumped through a standard to the locomotive-tender tank. Until a few years ago the storage tanks were usually of wood and were in the form of a huge barrel. They are now generally made of metal and have a rounded bottom, so that there is no floor on which sediment can form and cake. Water for locomotive boilers in many parts of the country needs to be treated with some form of water softener to prevent the chemical action of alkalies, etc., on the locomotive boiler tubes. Much attention has been given within the last few years to providing an adequate supply of good water for locomotive-boiler use. The Pennsylvania Railroad has spent much money in providing reservoirs at places where good water is obtainable and for piping this water to conveniently located water stations along its lines. Many other roads also are establishing reservoirs and making provision for an adequate supply of good water.

A storage tank necessitates the stopping of the locomotive during the time that the tender tank is being filled. For fast passenger express service some roads, of which the Pennsylvania Railroad and the Lake Shore and Michigan Southern are the two largest, have built what are called track tanks, which consist of a pan about 4 to 6 inches deep and ¼ mile long, placed between the rails and filled by pipes leading into the bottom of it. Locomotives are provided with a scoop which is dropped down into this pan, and the speed of the locomotive forces the water up the scoop and into a pipe leading to the tender tank. In this way a locomotive can take water while going at a speed of from 30 to 40 miles an hour. In winter it is necessary to have some system of warming the water so that it will not freeze in these track tanks. The water that is splashed on the ballast freezes and necessitates constant maintenance work. This form of water station is very expensive of operation and is justified only in a few instances where railroads have very fast and very long runs without a station stop.



PLAN AND PROFILE OF A HUMP YARD.

Power Plant. See ELECTRIC RAILWAYS.

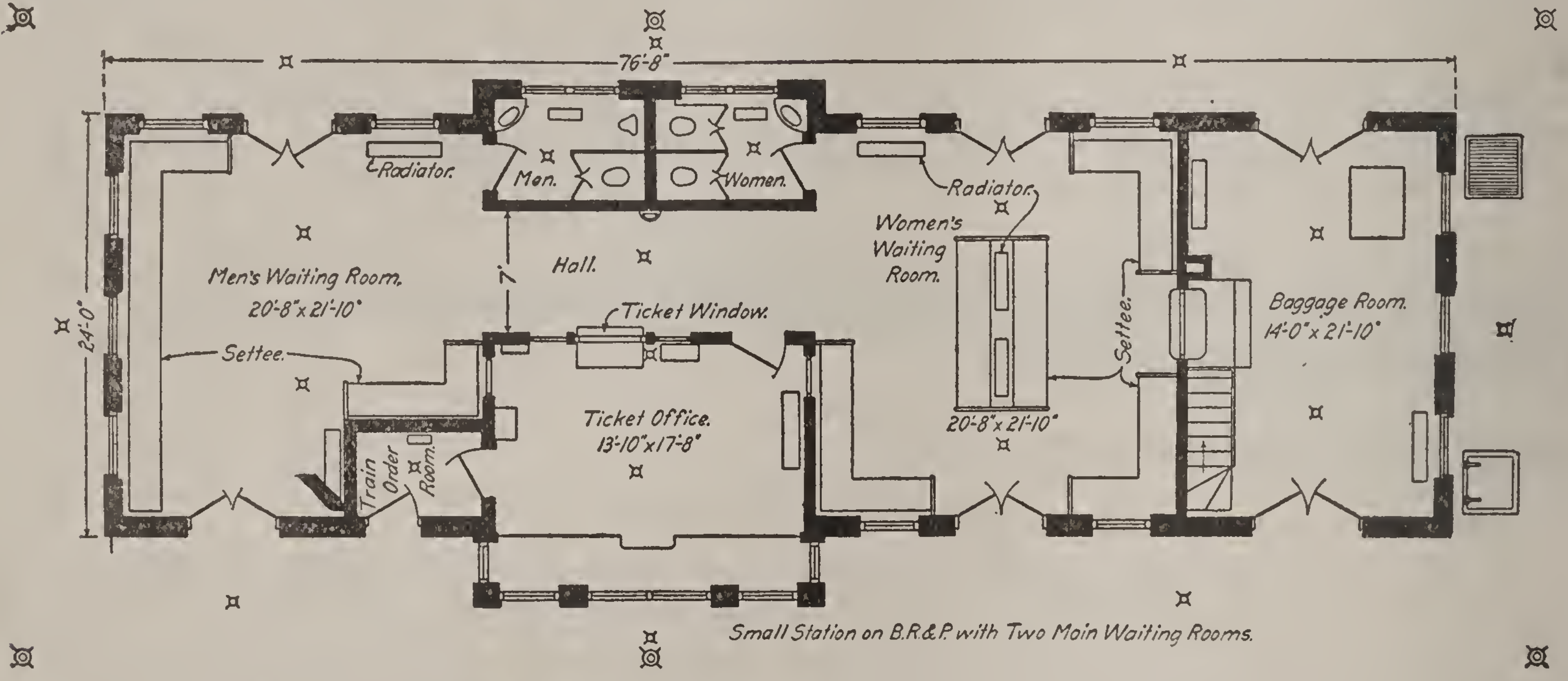
Yards and Terminals. The American Railway Engineering Association defines a yard as a system of tracks within defined limits provided for making up trains, for storing cars, and for other purposes, over which movements not authorized by time-table or by train order may be made subject to prescribed signals and regulations. A yard unit at a division terminal consists of a receiving, classification, and departure yard. With this unit are usually combined repair tracks and storage tracks for cabooses and engines. A yard system at a large terminal may consist of quite a number of yard units, it having been found more economical to increase the number of units rather than to increase the size of each unit, a yard track longer than the longest train which has to be handled through the yard being of course uneconomical because necessitating unnecessary movement of cars and engines.

When a train enters a receiving yard the road engine and the caboose are cut off and the work of distributing the cars is performed by a switching engine. The cars are then separated according to the needs of the trains. For instance all the cars containing one class of commodity may be sorted out and stored on one track, or the separation may be made according to districts to which the cars are destined. The classification yard is laid out so as to permit of the assembling or switching of cars which have been grouped according to districts in order of delivery at destination. The departure yard is those tracks which are used for the final bringing together of the cars that are to go out in a train and attaching the road engine and the caboose. Connected with this unit there are certain tracks which are used to store cars which for some reason cannot be sent directly through the yard. Connected more or less closely in point of distance with the yard are so-called team tracks and the freight-house tracks. The principle of these team tracks and freight-house tracks is the same, viz., they are tracks on which cars can be placed for either loading or unloading. If the loading or unloading is to be done in the open directly from or to wagons, no shed is provided, but sufficient room is left between the tracks for convenient roadways to be used by teams. If cars are loaded or unloaded through a freight house there are a series of tracks separated by platforms.

There is some difference of opinion as to whether an attempt should be made in the originating yard so to classify a freight train as to eliminate as far as possible switching until the final destination, or whether to reclassify the train at division terminals as necessity demands. The practice depends very largely on the class of commodities handled and the nature of the service. If it is possible to make up trains in the first place so that there will be very little switching at divisional terminals, this is the more economical way. On the other hand, if the nature of the service is such that a good deal of switching is necessary in any case at divisional yards, it is often more economical to spend less time and switching-engine mileage in the originating yard in an attempt to get a train that will theoretically be liable to the least switching at divisional terminals.

It is standard practice, where there is a very large amount of switching work to be done, to build a yard in such a way as to permit a considerable part of the switching to be done by gravity. Such a yard is generally known as a hump yard (q.v.). Cars are pushed to the top of the hump and from there are drilled or run down on to the classification tracks by means of gravity. In some large modern yards the cars are weighed as they pass over the hump and are released for the glide away from the hump by electricity.

Passenger-car yards are a comparatively simple system of tracks where passenger trains are broken or made up. Because of the cost of land within city limits it is customary for roads entering large cities to build both their freight and passenger yards outside of the city limits. Passenger trains are run out from the passenger station to the yard and are there broken up, and made up and brought into the passenger station ready for departure. Freight cars for loading and unloading at team tracks or freight houses are brought in from the yard, sometimes as far as 15 or 20 miles, and spotted at the proper points within the terminal for loading or unloading, and are collected from the terminal without switching and brought out to the classification yard. Some idea of the importance of the cost of freight-switching service may be gained from the estimates of C. L. Bardo as to the cost of switching a 60-car train. By the ordinary method of pushing and pulling cars without the help of gravity the time consumed was two hours, the wage expense $2.44, and the distance traveled by the locomotive 24,750 feet. By the use of a hump gravity yard the time consumed was 30 minutes, the wage expense $1.02, and the number of feet traveled by the locomotive 6000.



A SMALL STANDARD STATION PLAN, BUFFALO, ROCHESTER, AND PITTSBURGH RAILROAD.

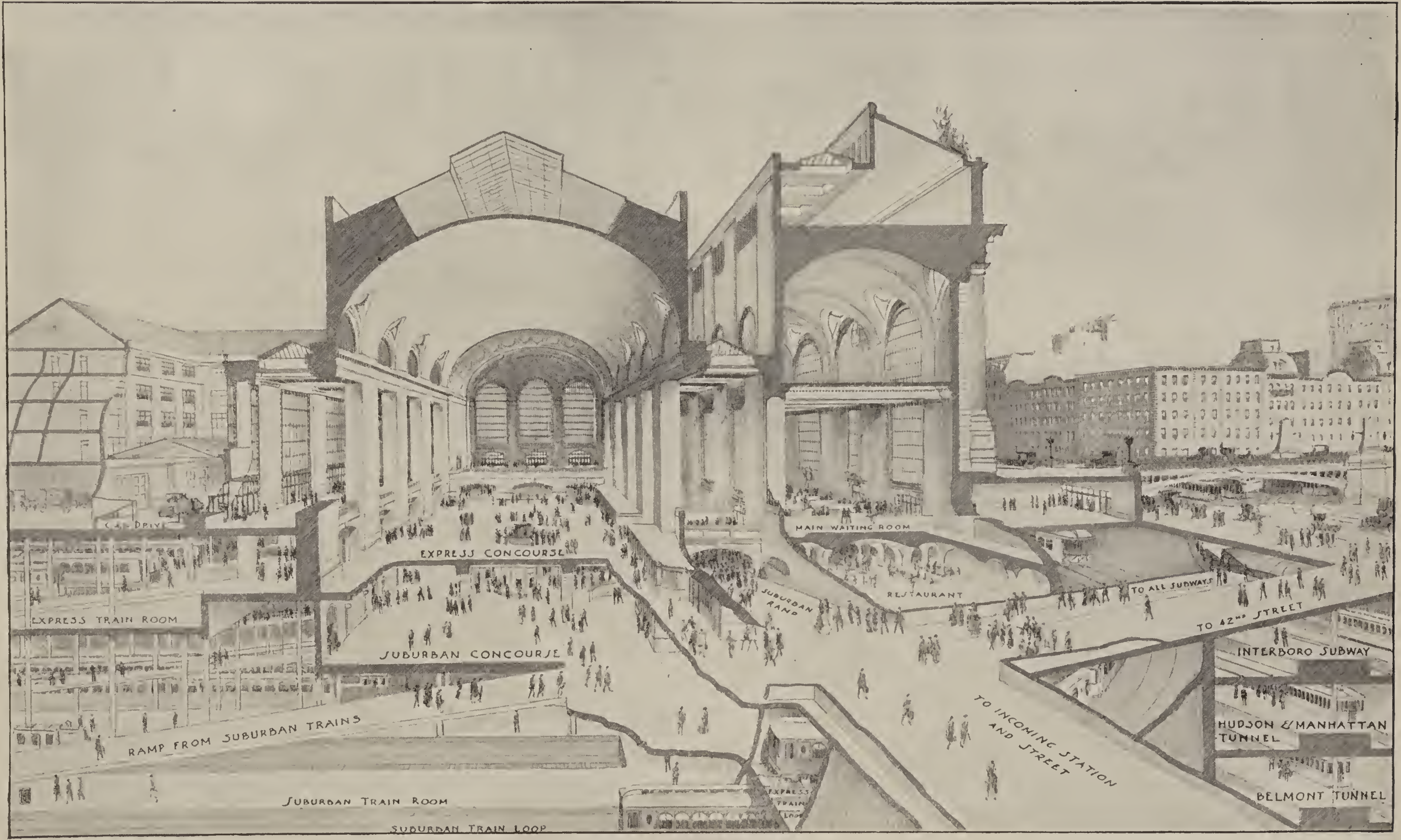
STATIONS

Passenger stations vary in size and elaborateness of construction from the station in a small town of 1000 inhabitants, through which possibly 10 to 20 persons pass a day, to the great passenger terminals in the cities.

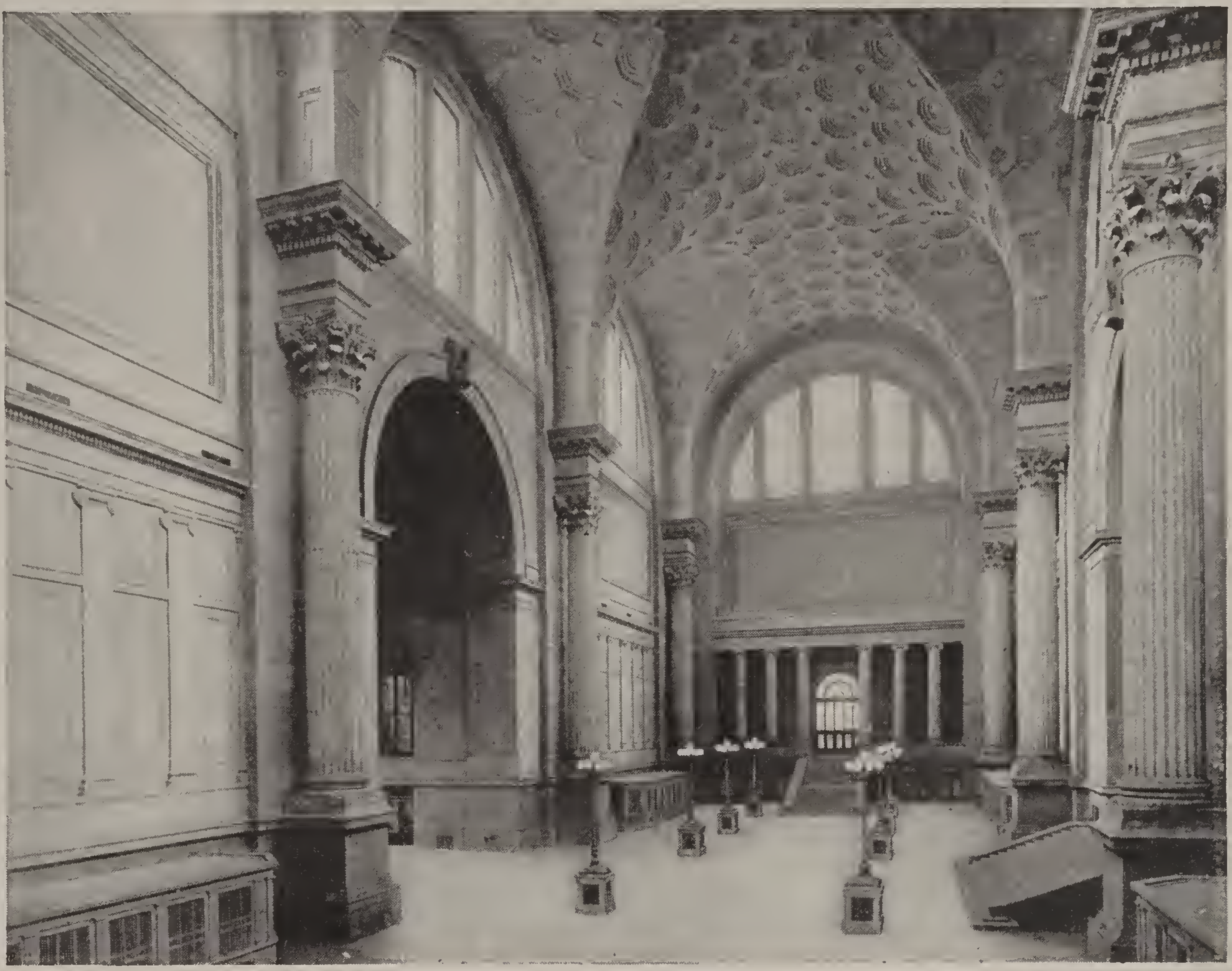
With the tremendous increase in passenger traffic and the increasing demand of the public for luxury in traveling, the progress in passenger-station building has been very great within the last few years. A striking example of the change that has taken place is afforded by the fact that the Grand Central terminal station, which was built in 1871 to take care of the New York Central and the New York, New Haven, and Hartford passenger business in New York City, was rebuilt in 1898 and 1899 and was at that time criticized as being in excess of any probable future needs. Within six years plans were begun for tearing this station down and building one many times as expensive and elaborate. The most notable and costly stations that have been built in the United States within the last 10 years are the Pennsylvania station at New York City, the Grand Central station at New York City, the Chicago and North Western's union station at Chicago (see illustration under CHICAGO), while others of considerable size are contemplated in several American cities.

Passenger stations naturally are very different in character. A combination depot or station handles freight and passenger business under one roof. Its chief requirements are a freight room with platforms on both sides, respectively next the tracks and next the yard or roadway, a waiting room, baggage room, and ticket office. Where the volume of traffic is sufficient, however, the freight and passenger buildings are separated, sometimes by a considerable distance. Local passenger stations are those situated at points between the terminals. They are of two types—through stations, in which the tracks pass through a shed having platforms on both sides and waiting rooms, offices, etc., on one or both sides, and side stations, located only on one side of the tracks.

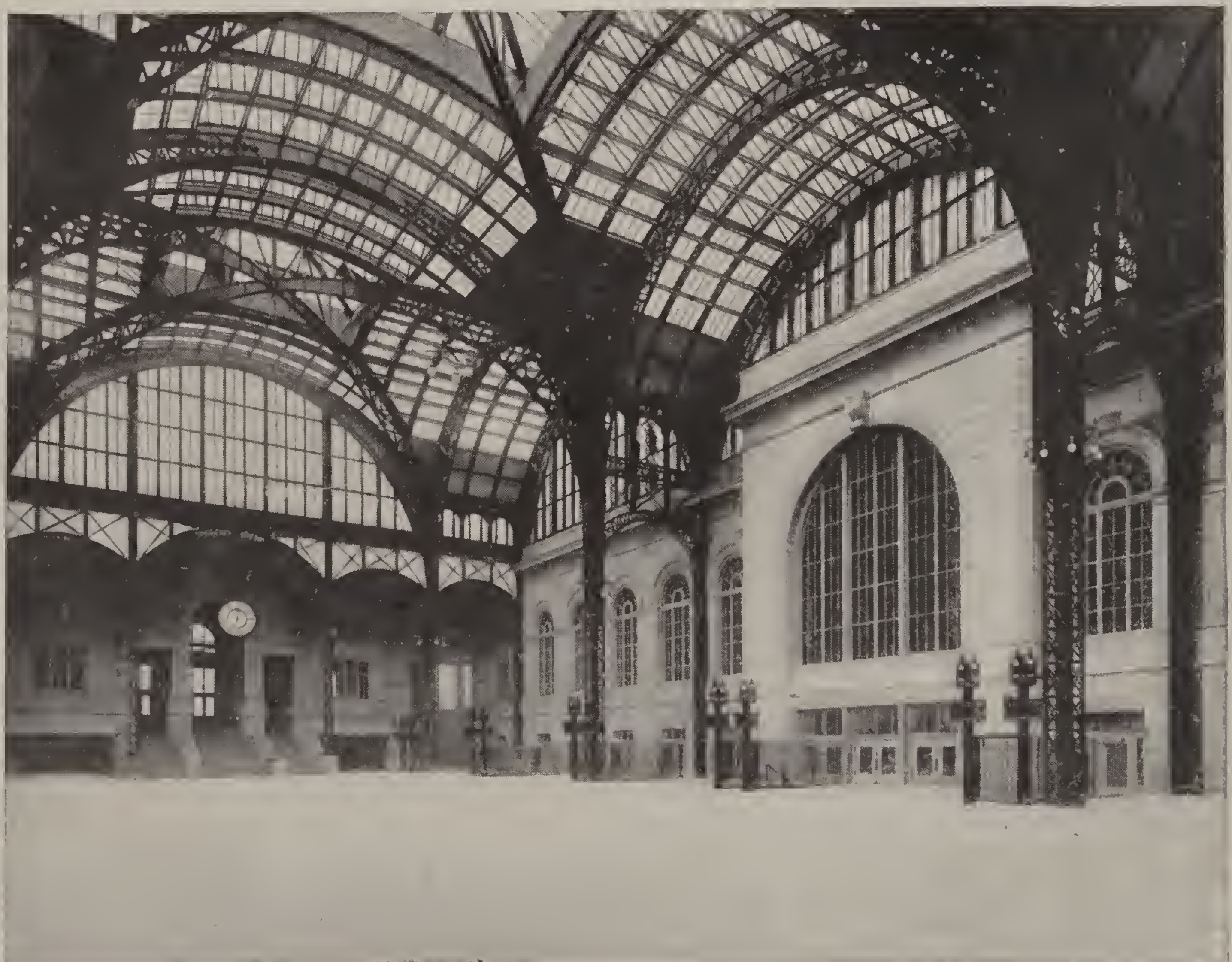
The Pennsylvania station in New York City is a through station; trains run into the station from New Jersey and after discharging passengers continue through the East River tunnels to the Sunnyside yards on Long Island. This avoids reverse movement, i.e., hauling empty trains out in the face of incoming loaded trains, etc., and was practicable because the Pennsylvania built its tremendously expensive tunnels under the Hudson River and under the East River. The New York Central station in New York is a stub station, but reverse movement will be avoided when the station is complete by a series of loops.



A MODERN AMERICAN RAILWAY TERMINAL
CROSS SECTION OF THE GRAND CENTRAL STATION, NEW YORK CITY



MAIN WAITING ROOM



CONCOURSE SHOWING TRAIN GATES AND INDICATORS

PENNSYLVANIA STATION, NEW YORK CITY

In European practice all but the most insignificant local stations are provided with bridges or tunnels for crossing the tracks. This important precaution for safety is too often neglected in the United States. The essentials of a small local station are a waiting room, divided into two parts respectively for men and women, a ticket office and a telegraph office (these two often combined in one), a baggage room, and lavatories (toilets) for men and for women. Such stations are usually long, low, one-story buildings, of frame construction where economy is necessary, but often (and generally in Europe) of brick or stone. The platforms are generally roofed over, wholly or in part. In the larger stations there are also restaurants, smoking rooms for men, rest rooms for women, news stands, telephone booths, and express offices. A union station is one which serves several railways in common. The planning of such a station, when it is a local and not a terminal station, offers many special problems; the same is true of junction stations, especially at intersections of two or more lines.

A terminal station differs from a local station in that, standing at the end of a line, all the general accommodations, or a large part of them, can be grouped in a head house of any desired size, at right angles to the tracks, with a concourse or platform from which the ends of all the track platforms are reached. The tracks, of which there may be many, are grouped in pairs, with a platform between each pair of pairs. The more important terminals are buildings of great magnificence and cost; the waiting rooms are of enormous size, and the provision of restaurants, parlors, offices and booths, and even of shops, is often lavish. Until about the beginning of the twentieth century the great European terminals and important through stations far surpassed those in American cities, e.g., the Gare de l'Est and Gare du Nord, Paris, the terminals at Vienna, the larger Italian stations (Milan, Genoa, etc.), the stations at Frankfort, Dresden, etc., in Germany, and one or two of the London stations. Many of these are now, however, out of date in style and equipment; but magnificent new stations have replaced some of the older ones (Gare de Lyon, Gare d'Orléans, Paris; Antwerp, Frankfort, Dresden, etc.).

It is the United States, however, which has now taken the unquestioned lead in this branch of architecture. There is still much to be done in America in reconstructing hundreds of antiquated local stations, and above all in improving their too often squalid surroundings. But much progress has already been made in this respect (e.g., Pittsburgh, Atlanta, Portland, Me., Worcester, Mass., Dayton, Ohio, and many others). Such terminals as the North Western at Chicago, the New York Central at New York, the Union at Washington, and the colossal Pennsylvania station in New York are in planning, design, and equipment unsurpassed and perhaps unequaled in Europe.

In two respects there is in modern railway architecture an increasing tendency to depart from old-time types, especially in the United States. The first is due to the more frequent elevation or depression of the tracks on approaching and entering or traversing a city. This necessitates dividing the functions and service of the station between two levels, that of the street and that of the tracks (New York; Broad Street, Philadelphia; Cleveland, Ohio; Baltimore, Md.; Antwerp; Gare d'Orléans, Paris; and many others). The other is the abandonment of the vast, metal-and-glass-roofed train shed in favor of separate platform roofs nearly but not quite meeting over the tracks. Such splendid structures as the arched train sheds of the Midland Terminal, London, or the former Grand Central station at New York are not likely to be repeated in the future.

Terminal and other station hotels are a common adjunct of English stations in important cities and are occasionally found on the Continent (Midland, Charing Cross in London; St. Lazare, Paris, etc.), but have never found favor in the United States.

Maintenance Costs. The cost of maintaining the right-of-way tracks and structures of an American railroad generally consumes from 12 to 15 per cent of total operating revenues. The cost of upkeep of a mile of single main track over which there is a traffic density (ton miles per year) of 1,000,000 and a passenger density (passengers one mile) of 200,000, where the track is rock-ballasted, laid with 90-pound rail, and the conditions of drainage, etc., not unusually bad, is in the neighborhood of $1300. The average cost per mile of track for the larger railroads in the United States varies from $900 to $1800. This includes the maintenance of structures, stations, etc., appertaining to the plant, but does not include any expenditures for maintenance of equipment. Track is maintained by section gangs which consist of a foreman and from four to seven men. A section of single track varies in length from 5 to 8 miles, 7 miles being the most common unit. When there are two or more tracks the length of section is correspondingly shortened, so that on a four-track road the section which a gang of seven men maintain will be about 2 miles of road.

Locomotives. See LOCOMOTIVE.

Freight Cars. The types of freight cars most generally used are the box car, gondola car, hopper car, flat car, tank car, stock car, and refrigerator car. The accompanying table shows the dimensions, weight, etc., of typical examples of each of these classes.

STANDARD AMERICAN FREIGHT CARS

	Capacity	Weight	Length	Width	Height
Box car	30 tons	35,700 lbs.	36 ft.	8 ft. 6 in.	8 ft.
Gondola car	50 “	43,200 “	40 “	9 “ 4 “	4 “ 6 in.
Hopper “	50 “	43,600 “	31 “ 6 in.	9 “ 4 “	
Flat “	50 “	37,900 “	34 “ 2 “	8 “ 10 “	
Tank “	12,000 gals. (50 tons)	45,400 “	33 “ 6 “		
Stock “	40 tons	40,000 “	40 “	8 “	8 “
Refrigerator car	30 “	49,800 “	32 “ 10 “	8 “ 4 “	7 “ 6 “

Wooden freight cars are being rapidly replaced by steel cars or steel-underframe cars. The great majority of coal cars, either gondola or hopper, are now being made of all steel; box cars are now generally made with steel underframes and some box cars are being made of all steel or with the wooden sides reënforced with steel ribs; tank cars are of all steel; refrigerator cars of steel underframe; and stock cars usually of steel underframe. Until recently iron wheels were in general use for freight cars, but with the adoption of the 50-ton (capacity) car steel wheels are in a great many instances being specified instead of iron wheels. The cost of maintenance of steel freight cars is not yet known with any degree of accuracy. The average yearly cost of repairs, exclusive of renewals or any allowance for depreciation, for all classes of cars in freight service varies from about $36, the average on the Chicago and Northwestern, to about $100, the average on the Pennsylvania and the Southern Pacific. The caboose is the car, generally weighing from 25,000 to 36,000 pounds, in which the freight-train crew rides. It usually has two or more bunks, a stove for heating and for cooking meals, lockers, etc.

Passenger Cars. The principal types of passenger cars in America are the coach, the sleeping car, the parlor car, and the observation or club car. In passenger-train service there are also the dining car, mail car, caboose, and express car. A coach has a seating capacity of from 60 to 80 passengers, is about 65 feet long, and has an inside width of from 8 to 9 feet. The standard sleeping car is about 70 feet long and has a compartment at either end and 16 sections, each section consisting of a lower and an upper berth, the lower berth being formed by the seats and the upper berth by a hanging platform which is pushed back during the daytime. The average annual cost of repairs of passenger-train cars varies on different roads from $500 to $1000. Passenger cars either with steel underframes or of all steel are being built for all the larger roads, the advantage of the all-steel car being in the resistance which it offers to destruction in accidents, the steel-underframe car also being far less likely to telescope in an accident than an all-wooden passenger car.

Elevated Railways may be divided into two classes according to use. One class is used for urban passenger traffic, affording a rapid-transit service auxiliary to street surface railways. A discussion of the economics of these railways will be found under STREET RAILWAY and URBAN TRANSPORTATION. The first elevated railway was a short line built in New York City in 1867, but the successful operation of such lines was begun in 1872 when the New York Elevated Railroad Company began running trains on Ninth Avenue from Battery Park to 30th Street, about 4 miles.

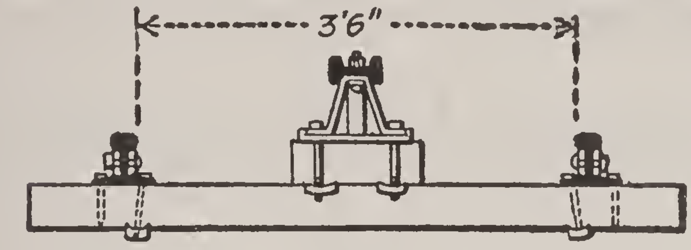
The engineering features usually involve some form of continuous-girder construction carried by suitable columns or pillars, and the design and erection present no serious difficulties. In the third-tracking of some of the elevated lines in New York City for express service in 1915, the raising of the added track above the level of the others required special construction which was adapted to individual requirements and where the erection was undertaken without interference with traffic.

The other elevated railways are those which are used by steam railways or electrified steam railways to avoid grade crossings in cities. The development of this type of railway has been rapid in recent years. In general the cost of elevating steam-railway tracks in cities has been borne by the railway company, although in some instances the cities have contributed a part of the cost of elevating tracks or of depressing transverse streets to avoid grade crossings. A great deal of track-elevation work has been done in Chicago, and the forms of construction used are varied in accordance with the nature of the particular problem, such as necessary clearances. width of right of way, etc., involved. In general some form of reënforced-concrete construction has been used. Usually supports are provided at the curbs and in the centres of the streets. Where spans are short a reënforced-concrete deck is used, and where concrete slab deck construction is not feasible I-beam decks incased in concrete are placed transversely and supported on through girders. Reënforced-concrete columns and cross girders are also used.

In the early history of railway building in the United States towns and cities were so eager to get railway facilities that they gladly gave rights of way through sections of business streets. In recent years, however, elimination of grade crossings by track elevation or otherwise has been demanded from railways in a great number of cities and towns. New Jersey and other States have passed laws compelling the railway to elevate their tracks through towns of more than a certain number of inhabitants, and while it has been possible to prove confiscation in many of these laws, the force of public opinion is causing heavy expenditures for track elevation.

Mountain Railways. The term "mountain railway" is applied to lines whose grades are too steep to be operated by locomotives, depending upon adhesion only for their drawing power, and which, therefore, necessitate the use of some special system of securing greater traction power. Several such systems are employed. The two principal ones are the Fell system, with a central, elevated, double-headed rail laid sideways, which is gripped by horizontal wheels on each side, which greatly augment the adhesion, and the system with central racks in which vertical cogwheels work, whereby the adhesion of the ordinary driving wheels is greatly assisted in drawing a train up the incline and the descent of the train is kept under control. This latter system embraces the Riggenbach, Abt, and other systems. In tourist lines ascending the steep sides of mountains for the sake of the views, a cogwheel working in a central track is generally used as the sole means of propulsion up the inclines. Lastly, where the ascent is steep, straight, and fairly short, a cable is employed for hauling up the vehicles, a system which has also occasionally been adopted for the steep inclines on ordinary railways.

The central-rail system was first adopted for crossing the Mont Cenis Pass by a railway laid mainly along the road between Saint-Michel and Susa, a distance of 48 miles, having a gauge of 3 feet, 7⅝ inches and surmounting a difference of level of 5300 feet between Susa and the summit, with a total variation in level between its termini of about 9900 feet. The ruling gradient was 1 in 12, the average gradient about 1 in 17, and the central rail, raised 7½ inches above the ordinary rail level, was laid along all gradients exceeding 1 in 25; while the minimum radius for the curves was 2 chains. The greatest train load carried over the Mont Cenis Fell Railway was 36 tons, and the heaviest locomotives employed on it weighed 26 tons. In this system the grip of the horizontal wheel on the central rail not merely secures sufficient adhesion to mount steep inclines, but also serves as a very effective brake in the descent and keeps the locomotive firmly on the line in going around sharp curves.



CENTRAL-RAIL SYSTEM FOR MOUNTAIN RAILWAYS.

The Rimutaka incline, on the Wellington and Featherstone Railway in New Zealand, with a gradient of 1 in 15 for 2½ miles and a total rise of 869 feet, opened about 1879, having a gauge, like the rest of the railway, of 3 feet, 6 inches and curves of 5 chains' radius, was laid with a central rail, and the traffic on the incline has been worked continuously by a locomotive with horizontal wheels gripping the central rail. Each engine, weighing about 36 tons, can draw a maximum train load of 70 tons up the incline; and in order to avoid an undue strain on the drawbars the three engines employed for taking up a heavy train are so distributed between the carriages as to enable each to draw its own load. The system has proved safe and satisfactory and well adapted for running around sharp curves; while the saving in cost of construction by adopting the incline on this particular railway, instead of a more circuitous course, to obtain flatter gradients, readily surmounted by ordinary locomotives, was estimated at £100,000.

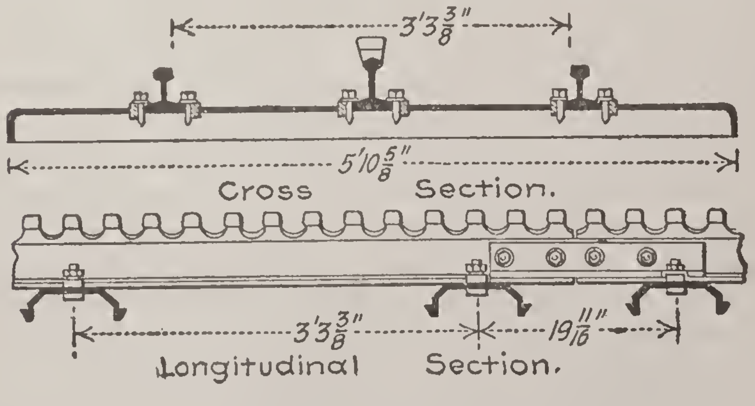
A solid central rack was introduced for the first time in 1847 on an incline of the Madison and Indianapolis Railway near Madison, Ind. It was 1⅓ miles long, with gradients of 1 in 16½ to 1 in 17. The rack railway, however, which was the precursor of the numerous Swiss mountain railways for tourists, was the line, 3 miles in length, constructed up to the top of Mount Washington in New Hampshire in 1866–69, rising altogether to a height of 3600 feet, with ruling gradient of 1 in 3. The rack in this case was formed in lengths of 10 feet, with two parallel angle irons, 4 inches apart, connected by a series of round wrought-iron bars constituting the teeth of the rack, which resembles a ladder laid on the ground. The locomotives, provided with a central cogwheel working in the ladder rack, push the vehicles up the mountain at a rate of about 3 miles an hour. The first rack railway carried out in Europe up a mountain slope was the Vitznau-Rigi Railway, constructed from Vitznau, on the Lake of Lucerne, to the summit of the Rigi in 1869–73, rising 4472 feet in its course of 4⅓ miles, with a ruling gradient of 1 in 4 for about a third of its length and never less than 1 in 6 except at the stations. The locomotive on these mountain lines is always placed below the carriages, so as to push them up the inclines and control their descent as well, the speed of the trains on the Rigi line being limited to between 3 and 4 miles an hour.

The driving cogwheel and the other cogwheels fitted to the locomotive and carriages are furnished with powerful brakes, which, when applied, keep the cogs firmly engaged in the rack, so as to arrest the descent of the train; and an air brake acting on the piston of the locomotive serves to regulate the downward speed. Strong hooks attached under the locomotive and carriages encircle the top flange of each sidepiece of the rack and thus secure the train from leaving the rails or being blown over by the wind.

A steel rack rail with teeth on each side, in which horizontal cogwheels work, was adopted for surmounting the exceptionally steep inclines of the Pilatus Railway, averaging 1 in 2.8, and attaining 1 in 2.08 in some places, preliminary trials having proved that the ladder rack was unsuitable for such gradients. This railway, opened in 1889, starts from Alpnach, on the Lake of Lucerne, and rises 5363 feet in its length of 2¾ miles. The driving cogwheels are actuated by spur gearing, and the two pairs of cogwheels are controlled by hand brakes, which suffice to regulate the descent of the train or to stop it if necessary. An air brake acting on the pistons of the locomotive furnishes additional control of the train on its descending journey; and if at any time the speed in descending becomes more than 3 miles an hour, a reserve automatic brake comes into action.

Another form of rack consists in cutting the edge of a flat steel bar so as to provide a uniform row of teeth on its upper side, and the strength of the rack can be increased for steeper gradients by increasing the thickness or the number of the bars. The rack is thus formed by a series of solid bars, with teeth shaped to the most convenient form for the working of the cogwheel in them. This simple form of rack, consisting of successive lengths of single bars joined at their ends and laid in the centre of the track, has been employed on the flatter gradients of several rack railways.

The Sant' Ellero-Saltino Railway, the first purely rack railway built in Italy, was constructed in 1892. This railway rises 2765 feet in a length of 5 miles, and it is laid to meter gauge, with a ruling gradient of 1 to 4.55. The rack on gradients not exceeding 1 in 8⅓ consists of two steel angle bars riveted together, 4 to 6 feet long, with teeth formed in them; but for steeper gradients up to the maximum of 1 in 4.55, two flat steel bars are introduced between the angle bars, increasing the thickness of the teeth and the rigidity of the rack, which latter can be still further augmented by introducing a distance piece between the angle bars, so as to form two or three parallel racks with a small interval between them, in which the cogwheel works with a widened bearing. This Telfener rack is simpler in construction and cheaper



TRACK CONSTRUCTION OF STRUB RACK RAILWAY.

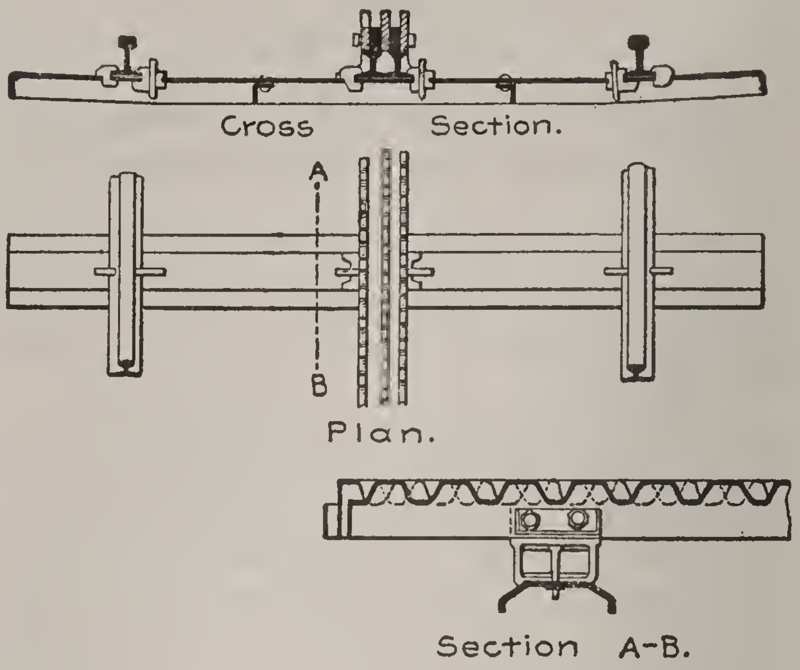
than the Riggenbach and Abt racks, but it does not possess the special advantage of the Abt rack, of thoroughly engaging two or three successive teeth of the cogwheel at the same time. The speed of the trains ranges from 5½ to 4⅓ miles an hour, according to the gradients, and averages 5 miles an hour.

A more complicated form of single rack, resembling a flat-bottomed rail in its low portion and widened out considerably for the teeth at the top, called the Strub system, after its designer, is used on the Jungfrau Railway, which is laid to the meter gauge and was opened in 1899, the motive power being electricity generated by waterfalls on the mountain. This line rises 6657 feet in a length of 7⅗ miles, with gradients ranging from 1 in 14⅓ up to 1 in 5; and the upper 6⅕ miles are in tunnel, completed in 1912, while the final ascent to the summit is to be effected by an elevator with a lift of 241 feet. The central rack rails, 11½ feet long, are joined together at their ends by fishplates, like ordinary flat-bottomed rails. A brake is provided, which encircles and grips the widened-out head of the rack.

The Abt system consists essentially of two or three steel rack bars, from $\frac{11}{16}$ inch to $1\frac{3}{16}$ inches thick and 2 to 4⅓ inches deep, placed nearly 2 inches apart and so arranged that the teeth are not opposite each other, but as it were break joints, causing the cogwheels to engage in a tooth in front on one rack before leaving the tooth behind on the adjacent rack, which renders the motion smoother and increases the security of the trains in descending, besides proportioning the strength of the rack to the steepness of the gradient by the addition of one or two bars. The Generoso Railway in Italy and the Rothorn Railway in Switzerland, 5⅔ miles and 4⅘ miles long, rising 4326 feet and 5515 feet, with ruling gradients of 1 in 4.55 and 1 in 5, and constructed in 1889–90 and 1891, respectively, are laid to a gauge of 2 feet, 7½ inches, with cast-steel sleepers, and provided with a double Abt rack in which cogwheels on the driving axles work. The system has also been extended to mountain lines in several other countries, as, e.g., the Manitou and Pikes Peak Railway in Colorado, of standard gauge, rising 7552 feet in a length of 8¾ miles, with a maximum gradient of 1 in 4.

On the state railways of Chile there is a 36-mile section of rack railway near the station of Palquico, on 6 per cent grades, and at Illapel, at an elevation of 4800 feet above sea level, there is another section of rack about 10 miles in length, which includes the Espino Tunnel, nearly 1 mile long, with a grade through it of 6 per cent. The Transandine Railway, connecting Argentina with Chile, passes over the Andes by means of a tunnel at 10,500 feet elevation. On the easterly slope of the mountains there are 8 miles of rack railway, and about 13 miles on the west or Chilean side. The steepness of this part of the line is between 7 and 8 per cent, and the rack is built on the Abt system, with three bars instead of the two usually employed. On the line of the Arica-La Paz Railway, connecting the former place in Chile with the latter in Bolivia, out of a total length of 274 miles there are 24 miles of rack built on the Abt system, with a grade of nearly 6 per cent. The summit of the line in the Andes reaches an elevation of 13,970 feet. These lines are difficult to operate in winter owing to excessive depths of snow and the formation of ice in the teeth of the racks, thus causing derailments.

Instances of the application of electricity as the motive power on mountain railways laid with the Abt rack, where water power is readily available for generating the electrical current, are furnished by the Mont Salève Railway, near Geneva, and the Gornergrat Railway ascending from Zermatt. These railways, constructed in 1891 and 1896–98, respectively, have lengths of 5⅗ miles and 5⅘ miles, with rises of 2363 feet and 4600 feet, and are laid to the meter gauge, with gradients of 1 in 4 and 1 in 5 and a double line of rack. In all these rack railways special care is always taken to anchor the track firmly down into the solid ground, so as to prevent its creeping gradually downhill under the pressure of the cogwheels on the rack.



TRACK CONSTRUCTION OF ABT RACK RAILWAY.

RAILWAY MANAGEMENT

The organization of a railway company, large or small, may be divided into the executive department, the legal and financial departments, the operating department, the traffic (sales) department, and the engineering department. On a small road the president is usually not only the chief executive, but also acts as the head of the other departments. On a large railroad of 2000 or 3000 miles it becomes necessary, of course, to diversify the organization to a considerable extent. A typical organization on a 3000-mile road would be as follows: the chairman of the board of directors is chief executive officer; then comes the president, who is in charge of all departments of operating the road, but whose relations with the legal and financial and accounting departments are advisory rather than superior to these departments, reporting to the chairman of the board. The general counsel is in charge of the legal department, and the secretary or vice president is in charge of the financial department. There is a vice president in charge of the operating department, a vice president in charge of the traffic department, and a vice president or chief engineer in charge of the engineering department.

There are two quite different systems of railway organization. These are known as the divisional form of organization and the departmental form of organization.

The three departments of a railway organization analogous to other large corporations are the executive, legal, and financial. The four departments into which a railway organization as transportation, producing, and selling plant is divided are: *operating*, the department in charge of the movement of trains; *traffic*, the department in charge of the solicitation of freight and passenger business and the fixing of rates; *engineering*, the department in charge of the physical upkeep and betterment of the plant exclusive of the engines and cars; and *mechanical*, the department in charge of the physical upkeep and betterment of engines and cars.

The departmental form of organization is the form in almost universal use in England and in France and Germany. The various New York Central Lines have this form of organization, and it is followed on quite a number of other roads in the United States. Under this scheme the vice president in charge of operation has under him a general manager, who in turn has one or more assistants, and has reporting to him two or more general superintendents, a superintendent of transportation, and a staff of division superintendents. The division superintendent has jurisdiction over only the operation of his division. Under him are the train masters, the chief train dispatcher, and the train dispatchers. The dispatchers are the lowest officers in the operating department. The train master, therefore, has reporting to him the petty officers in actual charge of directing the movement of trains and the employees engaged in this service. The enginemen, firemen, conductors, and brakemen form the train crew, the yardmaster and his assistants and the yard train crews are engaged in getting trains ready for the road train crews, and telegraph operators, station agents, etc., are engaged in carrying out the orders of the chief and assistant train dispatchers. The train master is in charge of discipline of employees under the supervision of the superintendents.

The vice president in charge of engineering or the chief engineer is the head of both the construction and the maintenance-of-way forces. His subordinate officers are the assistant engineers, office engineers, engineers of bridges and buildings, engineers of structures, and district engineers—these latter having a territory corresponding generally with that of the general superintendents—and finally division engineers, who, as the title implies, have jurisdiction over the maintenance-of-way forces on a given division, but who are not subordinate to the division superintendent or at least do not report to him. The chief engineer reports directly to the president and is not subordinate to the general manager.

In the mechanical department the superintendent of motive power has under him one or more assistants, district superintendents of motive power, and, in some cases, district master car builders, whose territory generally corresponds with that of general superintendents, and master mechanics, whose territory corresponds with that of the division engineer. Under the master mechanics are the general foremen and, in a strictly departmental organization, the road foremen of engines. The road foremen of engines instruct enginemen in their duties, and therefore report both to the master mechanic and to the train master. The underlying idea of the departmental organization is that there shall be an expert force for each class of work. The mechanical department, however, is under the direction of an officer, the superintendent of motive power, who does not report directly to the president but reports to the general manager.

The traffic department is entirely separate and is under the jurisdiction of a vice president, who reports to the president, and the traffic officers come in contact or conflict with the operating, mechanical, or engineering officers only to a very limited extent.

Under the departmental form of organization a difference of opinion between the division superintendent and the master mechanic has to be carried up through the operating staff, on the one side, and the mechanical staff, on the other, to the general manager. A difference of opinion between a division engineer and a division superintendent has to be carried up through the engineering department, on the one hand, and the operating department, on the other, to the president's office. On a small road where the president can be in close touch with all departments it is generally considered that the departmental form of organization works satisfactorily. On a large road, however, American experience has been that the divisional form of organization is better.

In this form of organization each division superintendent is really the general manager of his division. He has reporting to him not only the train masters and their petty officers and employees in train service, but also the master mechanics in charge of the division shops and the division engineers or roadmasters in charge of maintenance of way of the division. The division superintendent reports directly to the general manager, who in turn reports to the vice president in charge of operation. The general manager has on his staff a mechanical-department officer, generally with the title of superintendent of motive power, and one or more engineering officers with the title of engineer maintenance of way or something similar, who act as his advisers on technical matters and who may confer directly with master mechanics and with division engineers on matters of standards. It will be seen that this form of organization closely follows the practice in the United States army. A development of this divisional organization is the so-called unit system of organization.

The unit system of organization was worked out by Major Hine on the Union Pacific and Southern Pacific lines. Here, as in the divisional organization, the superintendent is the responsible ruler of his territory. He has under him a certain number of assistant superintendents, one performing the duties that were performed by the train master in the divisional organization, one performing the duties that were performed by the master mechanic, and one the duties that were performed by the division engineer. In addition he has an assistant superintendent, whose chief function is that of an office alter ego for the superintendent. The superintendent reports to the general manager, and the general manager has certain staff officers to advise him on mechanical and engineering matters, with the title, however, of assistant general managers instead of superintendent of motive power, engineer maintenance of way, etc. The radical departure that was made by Major Hine was to permit and encourage a master mechanic to learn something about and take some of the responsibilities of the transportation department or the engineering department, and a division engineer to do the same, and in this connection separate office files for these officers were done away with and a single divisional file is kept under this form of organization. One important advantage claimed for this system is that it does away with an immense amount of correspondence between the chief clerk of this officer and the chief clerk of that, etc. It has been found, however, in practice that it usually adds one officer to the staff of the division.

A division varies in length from 150 miles on the main line of the Pennsylvania to 650 miles on the single-track line of the Southern Pacific through the Arizona desert. In the one case the limitation of the power of supervision of the superintendent is fixed by the amount of traffic handled and the number of men required to handle it, and in the other case, that of the Southern Pacific, by the amount of territory which he can personally visit at frequent intervals. The problem has two sides, the intensive and the extensive side.

The traffic department has not been discussed under either the divisional or the departmental form of railway organization. This is in all cases a separate and distinct branch of the service. The traffic department originally formulated rates as well as solicited business. Since the Interstate Commerce Commission has absolute authority over rates, the first function of the traffic department has largely been taken from it and the solicitation of business is now its principal work.

In connection with the description of the form of organization of the officers of a road it is proper to make some mention of the mode of discipline. Discipline, of course, has to be strictly enforced, especially in train service, where the safety of life continually depends on the strict enforcement of the rules. On the other hand, the great power which has been obtained by the various labor organizations of trainmen has made the enforcement of strict discipline on railways particularly difficult. Discipline is usually administered by the train master, but sometimes directly by the superintendent. Punishment for infringement of the rules generally used to consist of suspension for a certain number of days for an offense that was not so serious as to require actual dismissal. Under this system the man's family often suffered as much, if not more, than the man himself. Brown's discipline, so called, was devised to remedy this and also to overcome the other objection to suspensions, viz., that the man's services might be badly needed. Under the Brown system of discipline a man is given a certain number of demerits for an offense which would have been punishable by suspension. When the total number of his demerits reaches a certain amount the man is supposed to be dismissed from the service. Good conduct over a certain period is often allowed as an offset to a certain number of demerits, and most roads find it very difficult, if not impossible, to discharge a man simply for an accumulation of demerit marks because of the pressure which the unions can bring to bear.

RAILWAY OPERATION

Transportation of either passengers or freight consists of a terminal service, a line haul, and another terminal service. The terminal service in the case of passengers is comparatively slight and consists in placing cars in the passenger station. In the case of freight, however, it may be quite a considerable part of the total service performed. Yard costs and movements were discussed above under *Yards and Terminals*, and it will only be necessary here to discuss the line movement of trains. The directing of the movement of trains is termed train dispatching. The simplest form of train dispatching and that which was in use quite generally on American railways during their early history was by means of train orders. A line was divided into certain sections and a train dispatcher was given charge of each section. Upon leaving a terminal on this section the train crew would receive a written order instructing them to proceed to this station or that station, to wait at this point or that point for an opposing train, or to wait at this point or that point for a superior train running in the same direction to pass them, and it was the business of the dispatcher to see that he did not issue orders which were conflicting. Stations along the line would report the passing of trains to the dispatcher, who in this way knew where the trains were on his district. He works with what is known as a train sheet, which consists of a large sheet of paper on which the names of stations on his district are printed one below another, with columns on either side of the station names corresponding in number to the number of trains passing over the division. The dispatcher follows the movement of a train by jotting down in the proper column opposite each station the time at which that train passes the station, a train northbound being entered on the right-hand side of the sheet and southbound on the left-hand side. On a road on which the automatic block system has been fully adopted (see BLOCK-SIGNAL SYSTEM), instead of issuing orders to the train crews the dispatcher issues orders to the tower men who are in charge of the operation of the signals. It can readily be understood that the work of the train dispatcher is one requiring quick and accurate thinking and a level head.

All regular passenger trains are moved on schedules and certain freight trains have regular schedules, but on most roads there are in addition to the freight trains that move on schedule a very large number of freight trains moving as extra trains. The combined schedules for all the passenger and freight trains on a division form the time-table for that division. The train dispatcher must work his extra trains in between the regularly scheduled trains. The preparation of a time-table for a busy division is a very important and complicated piece of work. The through fast passenger trains have to be taken care of first, then the local passenger trains, then time freights, and finally local freights and way freights. There are, of course, continually two considerations, which are often at variance, which govern the making of schedules. One is the convenience of the public to be served; the other is the economical arrangement for operating the division. In passenger service the convenience of the public is of course compelling. In freight service economy of operation is generally the first consideration, except for fast freights, and this is modified as need be by considerations of convenience.

The working time-tables which the train crews and railroad officers use contain the name of every station with the miles between, the scheduled speed of the train between those stations, information as to water tanks, passing sidings, etc.

The accompanying table shows some fast regular passenger schedules in the United States and in England and Europe and some slower typical runs.

REGULAR RUNS

From	To	Distance	Time	Average miles per hour	Name of railway	Country
London..........	Bristol	118.375	2 h.	59.2	Great Western	England
London..........	Edinburgh	393	7 h. 20 m.	52.8	Great Northern	"
New York.......	Albany	142.2	3 h. 2 m.	43.6	New York Central	United States
Philadelphia......	Atlantic City	56.5	55 m.	61.8	Philadelphia & Reading	" "
New York.......	Washington	226.9	5 h.	45.4	Pennsylvania	" "
New York.......	Chicago	978.7	20 h.	48.9	New York Central	" "
Chicago..........	St. Louis	290	7 h. 1 m.	41.3	Chicago & Eastern Illinois	" "
New York.......	Boston	232.61	5 h. 10 m.	45.6	New York, New Haven & Hartford	" "
Chicago..........	Los Angeles	2229	65 h.	34.3	Atchison, Topeka & Santa Fe	" "
Chicago..........	Jacksonville	1137	8 h. 15 m.	35	Chicago & Eastern Illinois	" "
Baltimore........	Chicago	794	25 h.	31.7	Western Maryland	" "
Cincinnati.......	New Orleans	923	26 h. 55 m.	34.2	Louisville & Nashville	" "

Freight Service. The most economical movement of heavy freight trains is generally at the rate of about 8 to 14 miles an hour. This is called drag freight, and such service, of course, can only be used where there is no competition in the time of delivery. Coal, iron ore, lumber, and like commodities are generally moved in drag-freight service, and the cost of such operation is comparatively low.

To compare the work of one railroad with that of another it is necessary to have some unit on which to measure the work done. In England the wagon (loaded car) and train are often the unit adopted. In America the train mile, the car mile, and the ton mile are all used as units on which to figure costs of service and to make comparisons between different classes of the service and the same service on different roads. Ton-mile cost, which means the cost of moving one ton one mile, is usually considered the most scientific basis on which to figure freight train service costs. In passenger service the cost of moving one passenger one mile is the commonly adopted unit in the United States, as it is also in England. In Germany, however, they estimate the weight of their passengers and reduce the cost of both freight and passengers to a weight multiplied by distance unit, and this method has been tried for certain purposes by some accounting officers of American railways. The argument for a train-mile cost basis of measuring service is that the train is the unit of the measure of expenditure, although it is not the unit of the measure of receipts. Train-mile costs vary widely as between different classes of service, different fuel costs, different wage scales, and many other factors, including size and power of locomotives, grades, etc. In making a study of such costs it is of great importance that an exact definition is agreed upon as to what shall be included in these costs.

ITEM	1914		1913		1912	
	Killed	Injured	Killed	Injured	Killed	Injured
Passengers:						
In train accidents..........................	85	7,001	181	8,662	139	9,391
Other causes..........................	180	8,120	222	7,877	179	6,995
Total..........................	265	15,121	403	16,539	318	16,386
Employees on duty:						
In train accidents..........................	452	4,823	557	6,905	596	7,098
In coupling accidents..........................	171	2,692	195	3,360	192	3,234
Overhead obstructions..........................	89	1,490	94	1,835	77	1,523
Falling from cars..........................	497	14,563	560	16,005	573	13,874
Other causes..........................	1,314	27,273	1,533	28,514	1,482	23,391
Total, employees..........................	2,523	50,841	2,939	56,619	2,920	49,120
Total, passengers and employees............	2,788	65,962	3,342	73,158	3,238	65,506
Employees not on duty..........................	327	1,097	362	1,178	315	959
Other persons, not trespassing:						
In train accidents..........................	9	148	9	110	13	277
Other causes..........................	1,298	5,827	1,279	5,932	1,185	4,746
Total..........................	1,307	5,975	1,288	6,042	1,198	5,023
Trespassers:						
In train accidents..........................	75	178	90	174	91	151
Other causes..........................	5,396	6,176	5,468	6,136	5,343	5.536
Total..........................	5,471	6,354	5,558	6,310	5,434	5,687
Grand total..........................	9,893	79,388	10,550	86,688	10,185	77,175

Demurrage. Closely connected with the question of suitable facilities for the rapid handling of freight are the difficulties for both carrier and shipper due to a lack of cars or the neglect of the consignee to remove his freight promptly. It is customary for the railway to allow the consignee a reasonable amount of time to remove his freight from the car and if this is exceeded to charge demurrage according to the time the car is kept on the track or out of service. Likewise when a shipper calls for a car and delays in loading beyond a reasonable time, the railway usually makes a similar charge. In the United States such claims and the justice of the basis on which they are made are often points of dispute between the carrier and the shipper. Rules for car service have been adopted by the American Railway Association, some of which apply to this question, and various decisions have been made bearing on this question by the Interstate Commerce Commission and by State railway commissions. In 12 States demurrage is regulated by statute and in 23 by orders of a State railway commission. In some States it has been proposed to charge a reciprocal demurrage against the railways, based on delay in furnishing cars promised or ordered.

ACCIDENTS

In the operation of both freight and passenger trains safety should, and generally does, rank ahead of any considerations of economy. There are exceptions to this rule, however, especially in the United States, since it is generally conceded that if all the roads were equipped with the automatic block system, safety from collisions would be very largely increased. Even with automatic block signals there is the human element which enters into the question of accidents, and the American railway man is more prone to disregard his instructions and to take chances than are either English railway employees or European railway employees. The lower table on page 507 gives the railway-accident records in the United States in 1912, 1913, and 1914.

The following table shows the accident record for England and Scotland (the United Kingdom) for the year ended June 30, 1914.

ITEM	Killed	Injured
Passengers:		
Train accidents	35	536
Other causes	110	2,230
Employees:		
Train accidents	11	95
Other causes	415	5,301
Trespassers, all causes	464	132
Other persons, all causes	100	193
Total	1,135	8,487

FREIGHT RATES AND TRAFFIC

Although the great majority of people in the United States are at one time or another passengers on railways and comparatively few are shippers of freight, freight service is the chief concern of the railway officer either from the point of view of earnings or from that of the number of men employed in and expenses on this service. To understand the present discussions of freight rates and the development that has taken place in the last few years in regard to rates and the regulation of rates, one must go over the history of railway freight service in the United States. It was early discovered that certain commodities would move by railway even when charged a high rate per 100 pounds per mile, while other commodities could only be induced to move if a low average rate per 100 pounds per mile were granted. The railway company can earn money only by selling the commodity which it manufactures, viz., transportation. There is the same problem facing the traffic man that faces the large retail merchant. There are two classes of people who patronize a department store—those who go there to buy something because they want it and those who go there because something is sold to them through the art of salesmanship.

The railway, to an even greater extent than the department store, has a very large fixed overhead charge. The interest on the cost of the plant must be paid whether or not any transportation is sold, and the roadbed must be kept in good repair whether a large number or but a few trains are moved over it each day. The cost of maintaining the roadbed varies to some extent with the amount of traffic which goes over it, but it costs but a very small percentage more to maintain track over which 100 trains pass a day than to maintain track over which 50 trains pass a day. The American traffic man argued somewhat in this way: if I can get enough from my freight rates on commodities that will come to my railway if I charge anything less than an exorbitant rate to pay the cost of this service and interest charges on the investment and upkeep of the plant, then if I get a rate on other commodities which will yield me anything above the bare additional cost of the service required to move these commodities, there is that much profit. Of course, this is stating the theory in a crude way. The freight-rate structure is fearfully and delicately complicated, but this way of stating the theory brings out clearly what is meant by the often quoted phrase that "rates are based on what the traffic will bear." Railway men have in recent years changed this phrase to "rates are made no higher than what the traffic will bear."

Besides this factor of a desire to induce the movement of commodities which can only move at a very low ton-mile rate, there is also the element of competition. Not only is there competition between two parallel roads serving the same communities, but there is competition between roads which serve the same markets with the same commodity, although that commodity may originate in entirely different parts of the country. Shoes that are sold in Denver are manufactured both in St. Louis and in Boston. Boston had the shoe industry well established before St. Louis began to ship consignments of shoes more than 100 or 200 miles from its own city limits. The railways running from St. Louis to Denver were asked to make such a rate on shoes to Denver as would permit St. Louis manufacturers to compete in Denver with Boston manufacturers. If this rate was made low enough so that the St. Louis manufacturers could get what, to them, seemed a fair share of the Denver business, Boston manufacturers brought pressure to bear on the roads running from Boston to Denver to get them to reduce the rate on shoes, and so on.

It was this competition between markets and the fact that the railway company's interests were so closely identified with the interests of the manufacturers on its lines that led to the extensive practice of rebates. The railway company wanted to make the large shippers on its lines larger. All of this tended to make the element of cost of service as a consideration in rate making of subordinate importance. It also tended to make the element of distance subordinate. Possibly as good an example of the reasons that led American railway managers to disregard distance in so far as possible is the practice in regard to commuters in passenger service. In passenger service, except in commutation service, distance is the controlling factor in rates; but the commuter business is closely analogous to freight business in the rate structure. A man can afford to pay, we will say, $4 a month car fare between his office and the suburban town where he would like to live. The town is built up by the establishment of a $4 a month commutation rate; land values go up, and the man finds that his rent is beginning to be prohibitive. He wants to move farther out, but he cannot afford to pay a proportionately larger commutation rate. For the next town, however, the railway makes a commutation rate that is only slightly higher. This induces him to move out, and by making a commutation rate lower per mile the farther out the commuter goes, the railway company induces a greater and greater number of families to move out into the suburbs. The commutation rate may even go lower than the actual cost of service, because by settling country that would not be colonized except for the low commutation rate the railway gets freight and express business and passenger business other than commutation business which it would not otherwise get. It was an exactly analogous theory that has been so large a factor in the formation of the freight-rate structures of the United States. Further discussion of this subject is taken up in *Government Regulation* below.

On the great majority of railways in America from 70 to 90 per cent of the total tonnage of freight carried is carried in carload lots. Less than carload lots of freight and certain kinds of commodities move on what are called class rates, the highest rate being charged to small package freight and the other commodities being grouped in classes.

PASSENGER TRAFFIC

On the majority of railways in the United States the total receipts from passenger fares are less than one-third of the total revenues from operation. There are a few exceptions to this general rule. The Long Island Railway derives more than half of its revenue from passenger fares. The New York, New Haven, and Hartford derives just about half of its revenues from passenger fares. It is, however, significant that the Long Island has operated at a deficit in every year from 1902 to 1914. The New York, New Haven, and Hartford in 1914 was on the verge of bankruptcy and had failed to earn its interest charges in the previous year and its dividends for a number of years previous to that. Although on most roads only a third, or less than a third, of the total revenue comes from the transportation of passengers, passenger train miles form fully half of the total train mileage. Train miles, as has previously been mentioned, is a commonly used unit for the comparison of operating costs. The revenue derived from the operation of a passenger train mile, including both the receipts from passenger fares and the receipts from mail and express carried on passenger trains, varies in different classes of service in the United States from about $1 to as high as $3. The receipts per freight train mile vary from $1.50 to $4.

Passenger rates per passenger mile have not decreased in the United States so rapidly or to the same extent as did freight rates previous to about 1906. On the other hand the cost of passenger service has been steadily increasing during the last 30 years, and especially has this been true during the last 10 years. The lowest to which passenger rates fell was two cents a mile, which was a rate put in by the New York, New Haven, and Hartford for all of its passenger service for a short time in 1912. The New York Central passenger rates between Albany, N. Y., and Buffalo are fixed by its charter at two cents per mile. The prevailing passenger rate, however, in the eastern section of the United States has been two and one-half cents per mile and in the West three cents per mile.

In addition to the regular rates charged for a local or through trip, there are special rates, such as excursion rates, mileage-book rates, and commutation-book rates. For instance, the one-way fare between New York and Washington was for a long time $5.50; the round-trip fare for a ticket good for 10 days was $10. Special excursions, however, are sometimes run, where the round-trip fare is but $3. The basis on which the passenger traffic manager justifies such a great difference as that between the one-way regular fare and the special excursion fare is that regular fares pay overhead charges, maintenance-of-way costs, and all those expenses which form so large a part of the railway company's total and which do not vary directly with the amount of business handled. It is only necessary, therefore, to clear something more than the actual out-of-pocket cost of moving excursion business to show a profit on this business. Since at least 99 per cent of the excursion business would not move at all between New York and Washington unless the rate were a great deal lower than the regular rate, the running of the excursion would not take away anything from the regular business, and the profit over and above out-of-pocket cost is a profit which otherwise would not have been earned. Whereas the average number of passengers per train in through passenger service between New York and Washington is about 70, an excursion train will carry in the neighborhood of 300 passengers. The total receipts per train mile, therefore, for the excursion trains are as high as or higher than the average receipts per train mile for regular service.

The principal factors which have tended to increase the costs of passenger service have been faster service, more frequent service, more space per passenger, more dead weight per passenger, and more luxurious accommodations. There is constant pressure brought to bear by local authorities on railways to compel them to give more frequent passenger service. After a train has once been put in service it is almost impossible to take it off, even if the railway finds that it does not average over 10 passengers per mile. The very proper demands for greater safety in railway service and especially, of course, in passenger service has added a great deal to the cost that should properly be charged against passenger service as distinguished from freight service. Automatic block signals are justified by the increased safety which they afford to passenger train service, but few roads would probably install them if there were no passenger service with its fast schedules. The adoption of steel passenger coaches, steel parlor and sleeping cars, and steel mail and baggage cars is costing the railways of the United States a sum which has been variously estimated at from $10,000,000 to $100,000,000 over and above what it would have cost to continue the use of wooden passenger equipment, replacing it when necessary with other wooden passenger equipment.

Sleeping Cars. The coach is the car usually used in local service and in through service at the regular fare. A sleeping car was put into service on the Cumberland Valley Railroad of Pennsylvania (now part of the Pennsylvania Railroad system) in 1836–37 but was abandoned in 1848. Various companies began the building of sleeping and parlor cars, and in 1870 to 1890 there were two large car companies which built and operated sleeping cars. These were the Pullman Company and the Wagner Palace Car Company. The Pullman Company, however, through the control of better patents and in the ordinary course of competition, became the only important sleeping-car company in the United States. This company not only builds sleeping cars and operates them, but also builds other types of cars and sells freight cars and express cars to Europe, South America, and England. There are some railway companies in the United States that operate their own sleeping cars. The Chicago, Milwaukee, and St. Paul is the largest railway company which in 1914 operated its own sleeping cars. The arrangement between the railway company and the Pullman Company for operation of sleeping cars when this service is performed for the railway company by the Pullman Company varies widely as between different railways. Where the potential Pullman passenger traffic per car mile is very light the railway company pays a substantial rental to the Pullman Company for its cars. This rental, of course, is in addition to the charge made the passenger by the Pullman Company. On the other hand, where the average number of passengers traveling in Pullman cars per car mile is very high, as it is on the New York Central, the Pullman Company pays the railway company something for carrying the car on its trains.

In 1910 the Interstate Commerce Commission made an exhaustive investigation into Pullman rates, and in an unusually comprehensive report signed by the chairman of the commission, Martin Knapp, it was held that Pullman rates were in general entirely reasonable, although it was suggested that a difference should be made between the charges for upper and for lower berths. This suggestion the Pullman Company almost immediately put into effect, but as an illustration of the fact that a majority of the public who travel in Pullman cars prefer additional comfort to decreased cost, lower berths at 25 to 33 per cent higher rates are almost invariably sold out before any considerable proportion of the upper berths are sold.

The new accounting rules of the Interstate Commerce Commission, which went into effect July 1, 1914, prescribe a form of accounts which shows the cost of sleeping-car, dining-car, and parlor-car service and the receipts from this service separately. The profit on sleeping and parlor car service which is operated by the railway company is in general very small; dining-car service is almost invariably performed at a loss. The exception to this is the dining-car service of the New York, New Haven, and Hartford, where the density of passenger traffic is so great as to permit the operation of this service on a scale which reduces the unit cost per meal served below the average receipts per meal.

The Canadian Pacific, which operates the only transcontinental, properly so called, line in America, operates its own sleeping-car service, parlor-car service, express service, and also many of the restaurants and hotels along its lines. It is the opinion of the directors of the Canadian Pacific Company, who are most closely in touch with the company's operations, that these outside services, especially the sleeping-car and parlor-car service, make a handsome profit for the company. The service, however, is not in general of so high a standard as that given by the Pullman Company on roads in the United States.

Railway Mail Traffic. Although some mail service and a considerable proportion of express service are performed by trains carrying no passengers, most passenger trains in through service also carry a mail or an express car or both. The United States government has paid the railways for the carriage of mail on the basis of the average weight carried. The basis is determined once in four years. This has given rise to a very bitter complaint on the part of railway managers generally, because, of course, the amount of mail carried is increasing steadily year by year, but there is no compensation for the additional weight carried each year over the weight carried in the year in which the government weighing tests were made.

The Bourne Bill, introduced into Congress in 1914, provided for annual weighing of the mails and for an increased rate of compensation, but failed to pass. The bill was the result of an investigation made by a congressional committee and was generally considered by railway managers as being much fairer than the system which was then in force. The introduction of the parcel post added much to the weight of the mail matter which railways were called on to carry and detracted from their receipts from express business.

Express Traffic. The transportation of express matter is paid for by the express companies on the basis of actual, not estimated, weight, so that any falling off in express business is at once reflected in decreased payments made by the express companies to the railways. The express companies' charges for the transportation of goods in the United States include the collection of the goods from the consignor and the delivery of the goods to the consignee. It differs from the freight service performed by railways both in the manner of handling at terminals and in the manner of handling in transit. Even where express or mail matter moves in solid trains these trains run at high scheduled speeds.

GOVERNMENT REGULATION

The basis on which the Federal government regulates railway rates, service, and operation is contained in Section 8 of the Constitution of the United States and is as follows: "The Congress shall have power . . . to regulate commerce with foreign nations and among the several states and with the Indian tribes."

The English common law gives the courts the right to regulate fares of common carriers, and American law has followed the English common law in this respect. The States, either through specific provisions in their constitutions or following the English common law, regulate the rates and operation of railways within their borders, but the Supreme Court of the United

States has held that this State power of regulation is limited by Federal power of regulation of interstate commerce. Railway companies are also subject to State regulation from another angle, that of their charters. All railways in the United States hold charters under the laws of some one or more States, and this has given rise to various conflicts in authorities between different States and between States and the Federal government or courts. The commission appointed by President Taft in 1909 to investigate and make a report on the question of the regulation of the issuance of securities by railway companies, and of which President Arthur T. Hadley of Yale University was chairman, recommended that railway companies be permitted to incorporate under the Federal statute, which would thus do away with the conflicting State laws in regard to incorporation. Up to 1914, however, no steps had been taken to carry out this recommendation.

The original Act to regulate commerce was passed by Congress in 1887. It was supplemented by the Elkins Act, passed in 1903 and amended in 1906, and the original Act was amended in a quite drastic way in 1910. This amendment, which left the Elkins Act in force, was known as the Mann-Elkins amendment to the Act to Regulate Commerce. The Act as amended in 1910 contains 24 sections, which are very briefly summarized below.

1. Railways, express companies, and sleeping-car companies are made subject to the Act. Charges by all these companies must be reasonable. Free transportation is prohibited, with certain exceptions, and a penalty of fine and imprisonment is provided for the violation of the free-transportation provisions. The railway company is forbidden to transport any article or commodity other than timber and the manufactured products thereof, manufactured, mined, or produced by it or under its authority, or which it may own in whole or in part, or in which it may have any interest, direct or indirect, except such articles or commodities as may be necessary and intended for its use in the conduct of its business as a common carrier. It must make switch connections with the shippers or branch railways on reasonable terms.

2. Discrimination and rebates are made unlawful.

3. Unreasonable preference for any particular firm, person, or corporation is made unlawful, and the railway company is required to afford all reasonable facilities for the interchange of traffic, but is not required to give the use of its tracks or terminal facilities to any other carrier engaged in like business.

4. It is unlawful to charge more for the transportation of passengers or like kinds of property for a shorter than for a longer distance over the same line in the same direction, the shorter distance being included within the longer, or to charge any greater compensation as a through route than the aggregate of the intermediate rates subject to the provisions of the Act. On application to the Interstate Commerce Commission a carrier may be authorized by the commission to charge less for longer than for shorter distances.

5. Pooling of freight and divisions of earnings are forbidden.

6. Each common carrier subject to the Act must publish tariffs showing all rates, fares, and other charges, and in the absence of joint rates as between different carriers separate rates must be shown by each one. The tariffs must be posted at certain places on the lines of each carrier, at which places they must be open for inspection by the public. No change in rates or tariffs is permitted without 30 days' notice to the commission, but the commission may at its discretion modify this time required for notice. All joint tariffs between different carriers and copies of all agreements or contracts between carriers must be filed with the Interstate Commerce Commission and the commission may prescribe the form of the tariffs, and no carrier is permitted to transport passengers or property where the rate has not been filed with the commission and published. The tariff rates must be charged and no deviation therefrom is permitted. Failure or refusal to comply with the terms of any regulation adopted by the commission in accordance with the provisions of this section makes a carrier liable to a penalty of $500 for each offense and $25 for every day during the continuance of the offense. This penalty is recoverable by a civil suit brought by the United States. The carrier must upon written request quote in writing the charges applicable on a described shipment between stated places under tariffs to which the carrier is a party. A damage or loss to a shipper resulting from the refusal of a carrier to furnish the information requested makes the carrier liable to a fine of $250.

7. It is unlawful for a common carrier to enter into a combination to prevent the carriage of freights from being continuous from the place of shipment to the place of destination.

8. The carrier is made liable for any damage or loss resulting to any person from failure to comply with the provisions of the Act to Regulate Commerce.

9. Persons claiming to be damaged may elect whether to complain to the commission or to bring suit in the Federal courts.

10. Any carrier, or officer or director of a carrier company, who shall do anything declared by the Act to be unlawful, or fail to do anything required to be done by the Act, shall be liable to a fine not exceeding $5000 for each offense, and if the offense shall be an unlawful discrimination in rates, the offender shall also be liable to imprisonment for two years. Any carrier or officer of a carrier who makes a false billing is subject to a fine of $5000 or imprisonment for two years. Any shipper or agent of a shipper who gives a false description of goods offered for transportation, in an attempt to obtain a refund or payment for damage, or a rate less than the published tariff, shall be liable to a fine of $5000 or imprisonment for two years.

11. The Interstate Commerce Commission, consisting of five commissioners (now seven, see Section 24), is to be appointed by the President with the advice and consent of the Senate; the commissioners' terms to be six years. A commissioner may be removed by the President for inefficiency, neglect of duty, or malfeasance in office. Not more than three of the commissioners shall be appointed from the same political party.

12. The commission is given the power and duty to inquire into the business of carriers, to require attendance and the testimony of witnesses, and to invoke the courts to compel witnesses to attend.

13. Any person, firm, corporation, or associa-

tion may make a complaint to the commission and it shall be the commission's duty to make an investigation, and the commission shall also have the power to make an investigation on its own motion in regard to any matter which could be the subject of a complaint.

14. The commission must make a full report of its investigations.

15. The commission may prescribe rates for the transportation of persons or property and the transmission of messages, and its orders in this respect shall be valid for two years. The commission may prescribe the proportions of through rates. Whenever any schedule involving a change in rates is filed with the commission, the commission has the power to suspend it either on the complaint of some one affected by the new schedule or on its own motion for 120 days, and for a further period of six months if necessary. The justification of any new rate after Jan. 1, 1910, which may be suspended by the commission, rests as a burden on the railway. The commission shall give precedence over other business to the hearing of suspension cases. The commission may establish through routes and rates, but the commission has not the power to prescribe a through rate between street and electric passenger railways. The shipper shall have the right to choose his own route. It shall be unlawful for a railway company or its employees to give out any information as to the kind, quantity, destination, consignee, or routing of any freight, and the penalty for the violation of this provision is a fine of $1000.

16. The Interstate Commerce Commission may award damages for violation of provisions of the Act, which damages may be collected through the Federal courts.

16a. After a decision or order has been made by the commission, any party thereto may at any time make an application for a rehearing of the same or any matter determined thereunder, and it shall be lawful for the commission in its discretion to grant such a rehearing.

17. The commission may prescribe its own form of procedure for hearings.

18. The salary of the commissioners is fixed at $7500 each (see Section 24).

19. The general offices of the commission are to be in Washington, but the hearings may be held anywhere in the United States.

20. The commission is authorized to require annual reports from carrier companies and to prescribe the contents of these reports and the manner in which accounts shall be kept. The annual reports are to be for the fiscal year ending June 30, unless the commission changes this to the calendar year ending December 31. The commission also has authority to require carriers to file monthly reports. The commission may prescribe the form of all accounts and of access to all accounts, and it shall be unlawful for the carrier company to keep accounts other than those prescribed or approved by the commission. An examiner of the carrier who divulges any information which comes to his knowledge in the course of examining the carrier's accounts except as directed by the commission or a court is subject to a fine of $5000 or imprisonment for two years. The District Court on request of the Attorney-General or of the commission may issue a writ of mandamus commanding common carriers to comply with the provisions of this section. Carriers must issue bills of lading, and lawful holders of bills of lading can recover full liability from the carrier for loss or damage to the property covered by the bill of lading.

21. The commission shall make an annual report to Congress on December 1 of each year.

22. Carriers may perform services at reduced rates or free for the United States, State or municipal governments, or for charitable purposes, or to or from fairs and expositions, and may issue mileage, excursion, or commutation passenger tickets, give reduced rates to ministers of religion, or for the transportation of inmates of national homes or State homes for disabled volunteer soldiers, etc.

23. District courts of the United States have jurisdiction to issue writs of mandamus commanding the movement of interstate traffic or the furnishing of cars; provided, however, that the carrier shall be compensated for such service, but the amount of the compensation need not be determined until after the provisions of the writ have been carried out.

24. The commission is enlarged to seven members with a term of seven years each and salary of $10,000 each, and not more than four of the commissioners may be appointed from the same political party.

In addition to the Act to Regulate Commerce the principal Acts which have been passed by Congress affecting railways are as follows:

The Act creating the Commerce Court in 1910, which provided that three Circuit Court judges should act as a special court to hear appeals from decisions of the Interstate Commerce Commission, in other words to act as an intermediary between the Interstate Commerce Commission and the Supreme Court. In 1912 no provision was made for the expenses of this court, so that its functions, with the exception, of course, of the salaries of the judges, ceased to be performed.

The Elkins Act, passed in 1903 and amended in 1906, making it a criminal offense to give rebates.

The Act relating to testimony, passed in 1893 and amended in 1906, making it compulsory for persons subpœnaed to testify before the Interstate Commerce Commission.

The Expediting Act, passed in 1903 and amended in 1910, to give precedence to appeals from the Interstate Commerce Commission's rulings and providing that an appeal from a District Court shall lie directly to the Supreme Court of the United States.

The Safety Appliance Acts, passed in 1893 and amended in 1910, which prescribe certain forms of equipment, such as automatic couplers, grab irons, etc., for use on railways engaging in interstate commerce.

The Employers' Liability Act, passed in 1908 and amended in 1910, making common carriers liable to their employees or employees' dependents for injuries or death resulting from the negligence of officers, agents, or employees of the carriers, or defects or insufficiency due to its negligence in its cars, engines, appliances, track, etc.

The Hours of Service Law, passed in 1907, providing severe penalties for requiring or permitting employees in train service or telegraphers to remain on duty for more than 16 consecutive hours or to return to duty after 16 consecutive hours without 10 hours or more off duty, and no employee in its service may be permitted to remain on duty in any 24-hour period without at least 8 consecutive hours off duty.

Train dispatchers are not to be permitted to remain on duty for a period longer than 9 hours in every 24, in towers or stations operated night and day, and are not to be permitted to remain on duty longer than 13 hours in towers or stations occupied only during the daytime. Exceptions are permitted in cases of emergency.

The Accident Law, passed in 1910, requiring reports of all accidents to the Interstate Commerce Commission on a form prescribed by the commission.

The Ash-Pan Law, passed in 1908, requiring a certain type of ash pan and the inspection of locomotive boilers by employees of the Interstate Commerce Commission, further amended in 1914, which amendment made the entire locomotive subject to inspection by employees of the commission.

The Arbitration Act, passed in 1898 and amended in 1913 by the Newlands Act, providing that a board of mediation and conciliation shall at the request of either party to a dispute between railway companies and their employees try to bring about an agreement between the parties and that, failing to do so, the parties may ask for arbitration by a board of either three or five men, of whom one each or two each, as the case may be, shall be chosen by the parties to the controversy and the three or four or five members be chosen by the other members or in case of the failure of agreement by the Board of Mediation and Conciliation.

The Transportation of Explosives Act, passed in 1909, regulating the manner of the transportation of explosives and the marking of the same.

Regulation both by the States and by the Federal government was the sequel of very extensive aid, both local and national, to railway construction. This aid took the form of land grants, surveys, remission of duties on iron, and guarantee of railway securities by the government. Aid through land grants may be divided into gifts of the right of way and gifts of alternate sections of land along the right of way. This aid is important because of the fact that it led to the government regulation of railways. The Granger movement, which was a form of State regulation of railways, was in part the extreme reaction from the almost prodigal liberality of government aid and local aid to railways of the two previous decades.

From 1850 to 1860 aid of railways was predominant, although the Federal government took steps to regulate the mail service. From 1860 to 1870 aid was still being freely given, but there was also considerable regulation, largely of a negative character. From 1870 to 1880 the volume of railway bills in Congress increased tremendously. The revulsion against the Pacific railways policy began in 1869, and in 1876 there was a law passed which permitted land-grant roads to receive but 80 per cent of regular rates. The first comprehensive regulation of railway practice was the passage of laws regulating live-stock shipments.

The so-called Granger legislation followed the panic of 1873. The Farmer's Antimonopoly Convention was held at Des Moines, Iowa, on Aug. 13, 1873. Iowa passed a law in 1874 fixing maximum rates, and this was followed by similar laws in Wisconsin and Minnesota. The Granger movement had for its aim the improvement and construction of inland waterways, the construction of national freight railways, and the regulation of existing lines, but the regulation of existing lines consisted chiefly in an attempt to pass laws which would secure cheap transportation. The railways turned to the courts for protection, and the basis on which they asked for relief from State and Federal laws was that their property was being taken without due process of law. The courts finally upheld them in this contention in Smythe *v.* Ames, in which the Supreme Court of the United States held that a State Legislature could not fix railway rates which were so low as to fail to yield a fair return on the value of the property employed in the public service.

This decision of the Supreme Court has been the keynote of public policy in regard to the regulation of railways ever since. From the time of the passage of the Act to Regulate Commerce in 1887 down to the time of the passage of the Elkins Act in 1903 Federal regulation failed to obtain its primary object—the elimination of discrimination as between different shippers and the practice of giving rebates. The course of freight rates during that period was steadily downward, but only in small part can this be attributed to government regulation. Competition both between parallel railways and between railways serving the same markets or railways serving the same producing areas was largely responsible for the steadily decreasing average ton-mile rate. Of course the larger proportion of low-grade traffic, such as coal and lumber, is also responsible for the lower average rate. The feeling of the public against discrimination and rebates was far stronger than any general feeling that the level of rates as a whole was too high. Although it has been customary to attribute to government regulation the credit of having stopped rebating and discrimination, it was the decision of A. J. Cassatt and his associates on the Pennsylvania Railroad which made possible the passage of the Elkins Act, which made regulation in regard to discrimination and rebates effective. The amendment to the Elkins Act made it a criminal offense punishable by imprisonment for a railway officer to give rebates or to make a discrimination in rates as between different shippers. The passage of this Act followed the announcement by President Cassatt that the Pennsylvania Railroad was in favor of putting an end to rebating and would do all in its power to bring this about. Since 1906 the Interstate Commerce Commission work, in so far as the commission has been an organ for enforcing the prohibition of rebating, has been largely to decide cases where discrimination was not obvious and where there might be difference of opinion as to whether or not certain practices constituted discrimination.

Previous to the amendment of 1906 to the Act to Regulate Commerce the Interstate Commerce Commission did not have the power to fix a rate, although it might order a railway company to charge a lower rate than one then in effect. After Congress had granted it the power to fix maximum rates in 1906 and to award reparation where rates had been charged that were upon investigation held to have been unduly high, a vast number of complaints were filed with the commission, and in a great majority of the cases heard by the commission the decisions were unfavorable to the railway companies. The commission apparently took the point of view that its primary duty was to protect the shipper and the public against the railways.

By a process of attrition the Interstate Commerce Commission and the State commissions wore down both freight and passenger rates to a point which railway men began to believe in 1909 would injure the credit of United States railways. On the other hand the Interstate Commerce Commission had been asking Congress to grant it the power to suspend advances in rates until an investigation could be made, and in 1910 Congress passed the Mann-Elkins amendment, which gave the Interstate Commerce Commission this power and moreover placed the burden of proof of the reasonableness of the proposed advance rates upon the railways. Just before the passage of this amendment the railway companies by a concerted action horizontally increased their freight rates by about 10 per cent. The movement was so strongly opposed by public opinion that the Attorney-General of the United States at once filed a suit under the Sherman Antitrust Law charging the railways with conspiracy in restraint of trade. An agreement was reached by which the railway companies abandoned their rate advance and the Attorney-General abandoned the suit. There is no doubt in the mind of any one who studies the practices of the railways in regard to rates that the companies are technically violating the Sherman Antitrust Law all the time. Rates of different railways between the same points must of necessity be the same, otherwise all the traffic would move over the road having the lowest rate. Uniformity of rates has been obtained only through conference and agreement between the different roads.

After abandoning the increases in rates which they had made before the passage of the Mann-Elkins amendment, the railways made an application to the Interstate Commerce Commission under the provisions of the amendment asking for permission to increase their rates by about 10 per cent. The application of the roads east of the Mississippi and that of the roads west of the Mississippi River were treated by the commission as two cases and a long series of hearings were held in which the railways made an attempt to justify the advanced rates. The year 1910 was a particularly prosperous one for railways. It marked a reaction from the panic of 1907 and the depression of 1908, although men like President McCrea of the Pennsylvania and Julius Kruttschnitt of the Southern Pacific testified under oath that in their opinion, although superficially conditions indicated prosperity of the railways, the majority of the railway companies absolutely needed an increase in freight rates. This expert testimony was disregarded by the Interstate Commerce Commission, and in two long opinions, one by Commissioner Prouty in the Eastern case and the other by Commissioner Lane in the Western case, the commission refused to permit any of the advanced rates to go into effect. Both opinions were filled with expressions of friendship for the railways and all confidence in the credit of the companies and in their ability to raise new capital, and there were also many assurances of the commission's readiness to grant increases in rates whenever it should appear that these increases were actually needed.

Although not recognized by the commission in 1910, certain economic laws were at work which were destined to prove the commission wrong in its 1910 decision. These economic laws can best be understood from the description of a hypothetical case. A 500-mile railway is built, all of it being single track, with sidings 2000 feet long spaced about 20 miles apart. The passenger density on this road in 1900 was, we will say, 150,000 passenger miles per mile of road and the freight density 500,000 ton miles per mile of road. In the next five years the passenger density had increased by 30 per cent and the freight density by 50 per cent. During these years certain capital expenditures had been made for heavier locomotives, additional sidetracks, larger yards, etc., but the interest requirements on this new capital were more than offset by the increased net earnings per unit of business handled due to decreased cost per unit. At the end of another five years, however, the passenger density had reached 300,000 passenger miles per mile of road and the freight density 1,500,000 ton miles per mile of road and congestion had now become so great that to handle the business promptly and economically it became absolutely essential to double-track considerable portions of the road. Almost at one stroke overhead charges were added to by 80 to 90 per cent, maintenance charges were increased at least 50 per cent, while there was no corresponding increase in traffic, and whereas the single-track road had been worked up to 105 per cent of its economical capacity, the new double-track road was being worked only to about 40 per cent of its capacity. The unit cost of handling business had been, therefore, very greatly increased by the additional investment. This is what might be called the law of diminishing returns on the expansion of railway traffic. On the eastern roads especially this law has been at work ever since 1906. The railway presidents who testified in the 1910 rate advance case before the Interstate Commerce Commission recognized this fact, but the commission did not.

In 1913 an application was made to the Interstate Commerce Commission by the railways in what is known as official classification territory, i.e., the territory lying east of the Mississippi and north of the Potomac and Ohio rivers, for permission to increase rates by 5 per cent. The commission refused this permission to the majority of the railways involved, although granting permission to the railways lying between the line drawn from Buffalo south through Pittsburgh and the Ohio River to the Mississippi to increase some of their rates by 5 per cent.

The outbreak of the European War in August, 1914, accentuated the depression in business in the United States and railway earnings at once reflected the business depression. Application was made to the commission for a rehearing of the Eastern rate advance case and a vigorous campaign of publicity was undertaken by the railways to support their contentions. A delegation of railway executives headed by Frank Trumbull, chairman of the board of directors of the Chesapeake and Ohio Railway Company and of the Missouri, Kansas, and Texas, went to President Wilson and laid their case before him, asking him to do what he could to restore confidence in railway securities. In an open letter addressed to Mr. Trumbull President Wilson expressed his confidence in the railway situation, but at the same time expressed the opinion that all branches of the government should coöperate to support the credit of the railways of the United States. The commission reversed its former opinion and granted the roads permission to increase their rates by 5 per cent, making an exception, however, in regard to rates on coal. Shortly after this decision the Western roads made an application to the Interstate Commerce Commission to increase their rates, but most of these requests were refused.

Vitally connected with the course of regulation of railway rates and operation by Legislatures and by the State commissions and the Interstate Commerce Commission has been the attitude of the Federal and State courts. The first relief which the railways received from unlimited regulation was the court's decision that property could not be taken without due process of law. This was the only restriction which the courts would place on regulation, and in a long series of decisions the Supreme Court recognized more and more fully the authority of the Interstate Commerce Commission to prescribe rates and to regulate railway operation free from court review except where a confiscation could be proved. The check which came to regulation in 1914 was imposed not by the courts but by public opinion and the pressure which public opinion brought to bear on the Interstate Commerce Commission. Besides the series of decisions which have established beyond question apparently the Interstate Commerce Commission's right to determine finally and as a court of last appeal what is a reasonable rate so long as confiscation is not involved, there has been a series of decisions which have established the principle that wherever the Interstate Commerce Commission has taken jurisdiction in matters involving even indirectly interstate commerce, State legislatures and State commissions cannot interfere. Lastly in a decision handed down early in 1915 the United States Supreme Court held that each class of service rendered by a railway company has a legal right to earn a fair return on the value of the property used in that service and that, while railway managements may charge lower rates for certain services than would yield a fair return on the value of the property used in that service, it is not within the power of State Legislatures, and presumably of the Interstate Commerce Commission, to compel railways to adopt this policy. The result of these court decisions has been that the Interstate Commerce Commission in attempting to fix reasonable rates has deemed it essential to make a physical valuation of the railways, and after considerable agitation Congress passed a law providing for the valuation of the railways of the United States, and this work was begun in 1914. It is estimated that it will take a number of years to complete the work, and in this connection the Interstate Commerce Commission's rules for accounting by railway companies are of the utmost importance.

ENGLISH REGULATION OF RAILWAYS

English regulation of railways began in 1848. Before this there had been various bills presented to Parliament providing for specific acts of regulation, the first being that presented by James Morrison in 1836, which provided for limiting dividends and revising tolls. There were committees of investigation appointed in 1839, and at the instigation of Sir Robert Peel in 1846 Parliament passed laws restricting the flotation of fraudulent railway projects. In 1848 the Railway Commissioners, who were constituted by the Act of Parliament passed in 1846, drew up a scheme of supervision of railway policy. This board of commissioners was abolished by an Act passed in 1851. In 1854 a Tariff Act, so called, was passed which established a General Committee on Railway and Canal Bills in the House of Commons. In 1873 the Regulation Act was passed appointing three commissioners, who formed a tribunal which, in the first place, was judicially not administrative and the commissioners were appointed for five years.

Later an Act was passed forbidding railways to raise their rates, and after the passage of this Act it became necessary to obtain an Act of Parliament each time a rate advance was needed. This has tended to make English railway rates absolutely rigid, the companies, of course, seldom, if ever, reducing a rate to meet special circumstances because of the difficulty that would be encountered in getting Parliament to raise it again. The Railway Commission consists of the president of the Board of Trade, a secretary, and one member. The president of the Board of Trade, being a member of the British cabinet, is of course a political officer, holding his office only during the time his party is in government. The secretary and the other member are permanent nonpolitical appointees, holding office for indefinite periods. The principal work of these commissioners is the investigation of railway accidents, on which a report is made by an expert employed by the commission.

RAILWAY CAPITALIZATION AND FINANCE

A railway company in the United States is a corporation created under the laws of one of the States. Its charter provides the powers under which it builds its road and engages in the business of transportation or in other businesses which it may be expedient for it to engage in. With the exception of the so-called land-grant railroads mentioned in connection with the government regulation, the capital for American railways has all been provided through private subscriptions. In the days of the greatest activity in railway building the common method of procedure for the financing of the new project was somewhat as follows: a group of promoters secured options on a right of way between the points which were to be connected by the railway. A company was then formed and a charter obtained, and the right of way, or rather the options for the right of way, the promoters' services, etc., were sold to the new company, the new company paying in its own securities. This nominal cost was the first item, therefore, on the asset side of the balance sheet of the new company. The promoters then undertook to sell the securities of the new company, bonds being offered at a certain price, generally with a bonus of stock. From the proceeds of the sale of the bonds the grading and construction of the road were paid for, often equipment trust notes were issued to pay for the engines and cars necessary to equip the line, and the road began operation.

Gradually, if the project was successful, earnings over and above the interest charges on the bonds were put back into the property in the form of improvements, and if the company continued to be successful, in time it was built up out of earnings until its credit was sufficient to permit the sale of securities to pay for additions and betterments and to permit the payment of surplus earnings as dividends on the stock. If the company was not successful, as a very great number of railways built in the United States were not, it failed to earn interest charges on its bonds, would go into the hands of a receiver, and be reorganized. Often during the time of the receivership earnings would be used to make additions and betterments to the property instead of for the payment of bond interest, and so build up the physical plant and make it capable of earning a return on the securities of the new company which was formed at the time of the reorganization.

The stock of a railway company represents participation in the ownership of the property. Stock certificates are usually issued in denominations of $100 and multiples of that sum. As a matter of fact, however, the dollar sign on stock certificates means very little. Legally it is supposed to mean that $100 cash or the equivalent of cash has been paid into the company for every one-hundred-dollar certificate issued. Under English common law and under the Federal and most State laws of the United States, bondholders or other creditors of a railway company could compel stockholders to pay in to the company's treasury the full par value of the stock which they held, in case of a default of interest or principal on bonds or other indebtedness. The English courts early held, however, and the American courts followed them, that a stockholder who had innocently bought stock from other individuals believing that originally the full par value of the stock had been paid in to the company's treasury could not be held liable for the amount that was not so paid in. Since the fact that a stockholder was not the original purchaser from the company was prima facie evidence that he was an innocent stockholder, the theoretical remedy which the bondholder or creditor had was of practically no value.

Some corporations have been formed with stock having no nominal value but simply participating in the ownership of the assets and right to a distribution of profits, each share being equal to a certain fraction of the total. The Hadley Securities Commission recommended very strongly that if Federal incorporation were to be permitted to railway companies, stock should be issued without par value, i.e., simply participating certificates. As a matter of fact the present stock issues of all railway companies are really nothing but certificates of participation in the ownership of assets and the right to the distribution of profits.

Bonds of a railway company are of various classes, but may be divided into two general classes, one in which the bonds are secured by a mortgage on specific property, the other in which they are secured only by an indenture which is a promise to pay interest and principal made by the railway company. A bondholder is a creditor of the railway company. His claim may be secured either by a mortgage or simply by a promise to pay, but in either case theoretically he has no voice in the management of the property so long as interest payments are made when due and his principal is paid at maturity. Bondholders can of course obtain the protection of the courts if it can be proved that the owners of the property, the stockholders, are dissipating assets improperly.

With few exceptions new railway construction in the United States since 1895 has been carried on by existing railway companies through extensions and branch line building.

Railway Systems. A short account of the upbuilding of the various railway systems in the United States, such as the Harriman, Gould, Huntington, etc., will be found under the article UNITED STATES.

The need for new railway capital has been estimated variously at from $100,000,000 to $400,000,000 a year for the United States. The greater part of this new capital which has been raised since the beginning of the present century has been through the sale of bonds. With very few exceptions these bonds have been sold by the railway company to a group of bankers or to an individual banking house and by the bankers have been resold to investors. The railway company may sell its bonds or notes outright to the bankers at a fixed price, and the banker sells them to his customers at the best price which he can obtain, with the hope, of course, that he will make a profit on the transaction.

Underwriting of Securities. Another common method of railway financing is for the railway company to make an offering of either stock or bonds to its own stockholders at a certain price. The sale of these securities, however, is underwritten by a banking house or group of banking houses, which agree to take any of the securities which are not taken by the stockholders at a fixed price, usually lower by a certain amount than the price at which the securities were offered to stockholders. This is called the underwriting of securities, and the bankers are usually paid a certain commission which varies from 1 to 3 per cent. Thus, if the entire issue of securities was taken by the stockholders, the bankers would get their commission in payment for their willingness to have taken the issue, despite the fact that they were not called upon to advance any money whatsoever. On the other hand, if none of the issue, or only a small part of it, is taken by the stockholders, the railway company gets its money from the underwriters, despite the fact that eventually the underwriters may have to sell the securities to the public at a lower price than that which they paid the railway company.

Generally the banking house which underwrites the issue of securities or buys it outright from the railway company does not sell any great part of a large issue directly to the individual investors, but acts as a wholesaler, who in turn sells to jobbers, the so-called secondary private banking houses, who in turn sell, on the one hand, to the very large individual investor and, on the other, to retailers, the small bond houses, which eventually distribute the securities to their customers, the individual investors. The three large banking houses of original issue in the United States in 1916 were J. P. Morgan & Co., Kuhn, Loeb & Co., and Speyer & Co. There were in addition a large number of other banking houses, which were affiliated in interest more or less closely with one or more of these three banking houses, and also a number of independent banking houses which might buy directly from the railway companies or other corporations comparatively small issues of securities. The railway companies which have been financed very largely through the banking house of J. P. Morgan & Co. are the New York Central and its subsidiaries, the Great Northern, the Northern Pacific, the Southern Railway, the Chicago, Burlington, and Quincy, and the Chicago and Northwestern. The railways which have been financed principally by Kuhn, Loeb

& Co. are the Pennsylvania Railroad, the Union Pacific, the Southern Pacific, and the Illinois Central. The companies which have been financed principally through Speyer & Co. are the St. Louis and San Francisco, the Chicago, Rock Island, and Pacific, and the Gould lines.

The cost of building and equipping a mile of railway varies widely in different parts of the country and with the character of the country through which the road is built, as well as with the different standards which may be adopted. A road built over a comparatively level country, dirt ballasted, as were so many of the roads in the Southwest in the early days, with 60 or 70 pound rail, with light engines and a comparatively small number of cars, might be built for $15,000 a mile or even somewhat less. A double-track road built through mountainous country, with the present standards of concrete structures, heavy rail and heavy engines, with steel cars, will cost from $100,000 to $300,000 a mile. First-mortgage bonds of a railway company which has had a long record of prosperous operation, with the required dividend payments to its stockholders forming a margin of safety behind its interest charges, could be sold in 1913 to 1914 at a price which would cost the railway company about 4 per cent to 4½ per cent. On the other hand even first-mortgage bonds of a new company, secured on a road which is just being put in operation, could not have been sold during those years at a price which would have cost the railway company less than 5½ per cent to 6½ per cent, if they could have been sold at all.

The average capitalization, i.e., total par value of stock and face value of bonds outstanding against the 249,803 miles of railways of the United States in 1913 was $19,796,125,712. Of this more than one-half was represented by funded indebtedness. The bonded indebtedness had increased in the previous 15 years in very much greater proportion than had the stock. This has been one of the tendencies of railway financing in which bankers and students of railway economics have in general seen a danger to the continued high credit of railway securities as an investment. An investor in bonds of a standard railway company should expect absolute security of principal, barring, of course, some great national calamity, and security of interest except under some unforeseeable exceptional circumstance. This can only be assured if the railway property can earn a very substantial margin over its interest charges, even in a year of business depression. This margin over interest charges is, of course, the profit which belongs to the stockholders. The stockholders have the choice either of taking their profit through the declaration of dividends, which will be equivalent substantially to all the surplus earned after the payment of interest charges, or of taking only part of this profit through declaration of smaller dividends and of investing in the property the remaining surplus. The Pennsylvania Railroad, which is the most conservatively managed road in the United States, paid out in dividends just about half of the profits belonging to stockholders in each year, investing the remaining half as a margin of safety for future earning power of the property.

The Interstate Commerce Commission's system of accounts, under which system all railways of the United States doing an interstate business must be kept, defines expenses, as distinguished from additions and betterments, as the expenditures necessary for repairs and renewals of the plant necessary to keep it up to the standard in which it was at the beginning of the period for which accounts are kept. This leaves no provision for expenditures which are necessary to keep the property abreast of the continually progressing art of transportation. Such expenditures the commission holds to be paid for through the investment of new capital, either by the owners in the form of surplus not paid out in dividends or by the owners or others through the sale of new securities. Experience has shown that with the rapid progress which has been made in the development of heavier engines, larger cars, permanent structures, etc., the credit of a railway company can be maintained only through the investment of part of the surplus above interest charges of the property as an offset to this course of progress. Since investors will not become participants in the ownership of railways unless they will receive in profits a rate of return on the investment commensurate with what they could get from becoming part owners in some other business in which the risk was comparable, it follows that a railway company must, if it is to be able to secure capital needed for additions and betterments, earn not only its interest charges and a fair return on its stock, but also a substantial surplus as a margin of safety behind its dividends.

The tendency in the years 1906 to 1915 was to reduce this margin of safety materially, even for the strongest railway companies, to wipe it out entirely for the less strong companies, and to reduce net earnings even below the amount required to pay interest charges alone on many of the weaker railway companies. It was on the basis of these facts that the railway companies appealed to the Interstate Commerce Commission for permission to increase their freight rates in 1910 and again in 1913 and 1914. Various other expedients besides increasing railway rates have been suggested to meet this situation. One has been that the government shall guarantee a certain per cent on railway securities and in exchange receive representation on the board of directors of the company. Another is that the government take over the operation and the ownership of the railways of the United States, paying the present holders of railway securities a sum to be fixed by the court. This is generally called in the United States government ownership and is spoken of in England usually as the nationalization of the railways.

See AIR BRAKE; BLOCK-SIGNAL SYSTEM; BRIDGE; ELECTRIC RAILWAYS; LOCOMOTIVE; STREET RAILWAY; TUNNEL; PUBLIC UTILITIES, REGULATION OF.

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RAILWAY TRAINMEN, BROTHERHOOD OF. See RAILWAY BROTHERHOODS.

RAIMONDI, rī-mōn′dē, ANTONIO (1825–90). An Italian geographer and naturalist, born in Milan. In 1850 he went to Peru and was professor of botany in the University of Lima from 1862 to 1871. During this time he explored the country and gathered material for his proposed exhaustive work on the geography, botany, zoölogy, and ethnology of Peru. Four volumes had been published before his death under the title *El Perú*, but a part of the work, which is of the highest importance, was destroyed when Lima was captured in the Chilean War. His manuscripts became the property of the Lima Geographical Society. An edition of *El Perú* was published at Lima in 1890–1902 (3 vols.).

RAIMONDI, MARCANTONIO (c.1480–c.1534). The chief Italian line engraver of the Renaissance. The details of his life are uncertain, but it is thought he was born about 1480 in Bologna, where he studied engraving under Francia, devoting himself at first to niello, then to line engravings after the paintings of his master and after his own designs. The influence of the German engravers, like Schongauer, is evident, particularly in the landscape backgrounds. Greatly impressed by Dürer's engravings, he copied about 70 of his woodcuts and copperplates in line engraving, even counterfeiting the signature and pirating without acknowledgment the entire *Life of the Virgin* and the *Little Passion.* But Vasari's statement that Dürer obtained redress from the Venetian government is improbable, since the first series was not published until after Dürer's visit to Venice in 1506.

Until 1510 Raimondi resided at Bologna, with occasional visits to Venice, but in that year he seems to have been at Florence, since it was the date of his celebrated engraving, "Les Grimpeurs" (The Climbers), after Michelangelo's cartoon, the "Battle of Anghiari," the background of which was taken from Lucas van Leyden. He was then probably on the road to Rome, where he thenceforth devoted himself to the reproduction of the works of Raphael, conducting a flourishing school and printing establishment in conjunction with Raphael's color grinder, Baviera. Most of his plates are free interpretations of Raphael, probably executed after the latter's designs or studies, not after the finished paintings. Marcantonio carried out these designs with great vigor and charm, rendering, as no other has done, the forms of Raphael, not only in line, but in spirit. His early plates in particular are distinguished by perfection of line and mellowness of tone; his later are more summarily executed. Among the best after Raphael are: "Poetry"; "The Massacre of the Innocents"; "Quos Ego" (Neptune riding on a shell); "Lucretia"; "The Judgment of Paris"; "The Death of Dido"; etc. After Raphael's death he engraved after Giulio Romano, notably a "Hercules and Antæus," and after the antique, which he was largely instrumental in popularizing. His engraving of Giulio's illustrations of Aretino's *Sonnetti lussuriosi* caused his imprisonment by Clement VII, and he was ruined by the sack of Rome in 1527, when he was held for ransom by the Spaniards at an exorbitant sum. Afterward he seems to have returned to Bologna, where he died not later than 1534. His chief pupils at Rome were Agostino Veneziano and Marco Dente of Ravenna, whose work is often confounded with their masters. Consult Delaborde, *Marc-Antoine Raimondi* (Paris, 1887), and *Marc Antonio,* in "Great Engravers Series" (London, 1912).

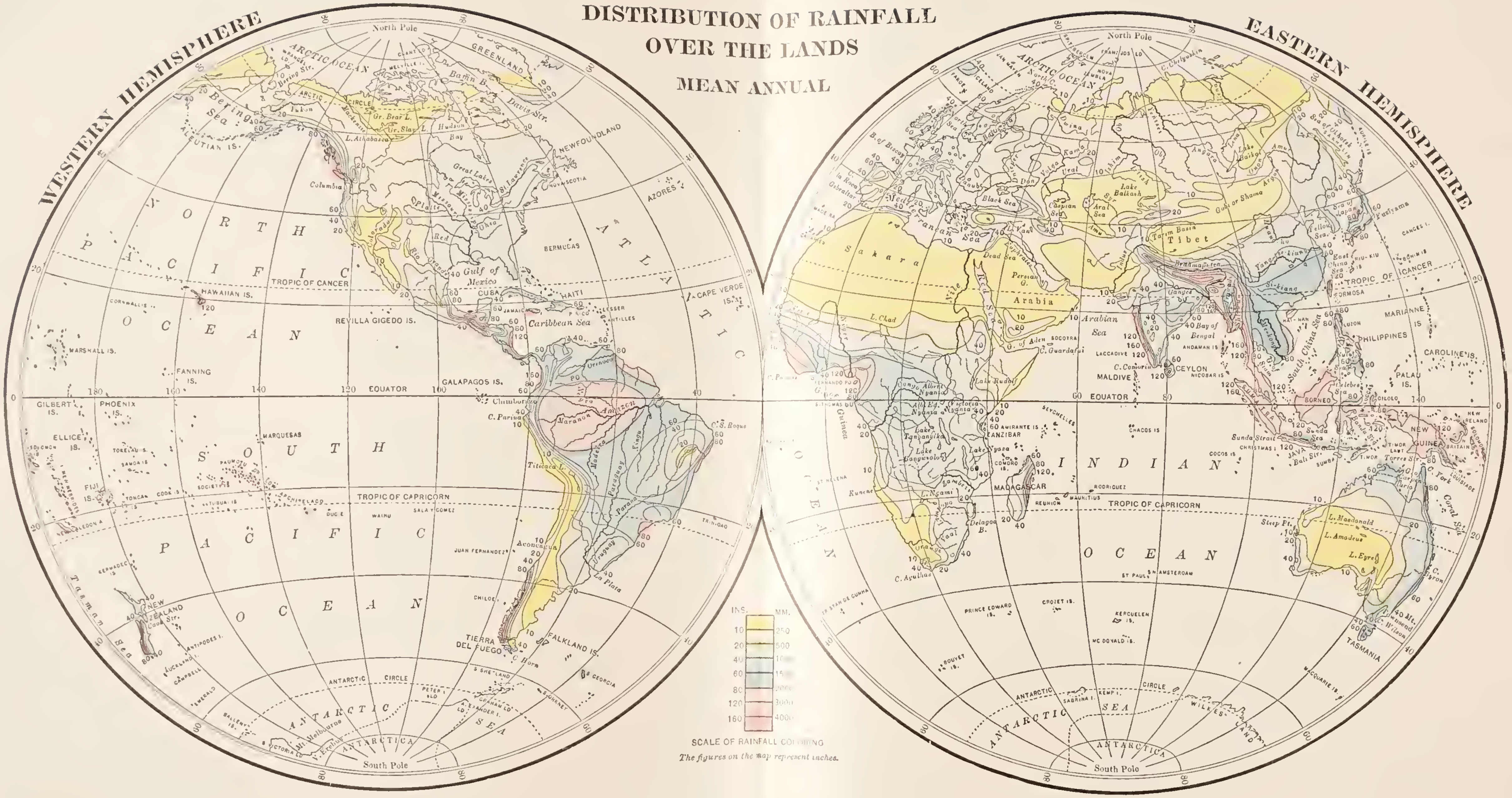
RAIMUND, rī′mụnt, FERDINAND (1790–1836). An Austrian actor and playwright, born in Vienna. After playing on provincial stages in Hungary, he secured an engagement in Vienna at the Josephstädter Theatre, in 1813 and in 1817 at the Leopoldstädter Theatre, where he soon became the most popular exponent of local comedy and which he managed as director in 1828–30. In the meanwhile he had come before the public as a popular dramatist with *Der Barometermacher auf der Zauberinsel* (1823), after the fashion of the old Viennese extravaganza; *Der Diamant des Geisterkönigs* (1824); *Das Mädchen aus der Feenwelt, oder Der Bauer als Millionär* (1826); *Der Alpenkönig und der Menschenfeind* (1828); and others which, after severing his connection with the Leopoldstädter Theatre, he presented on the stages of Munich, Hamburg, and Berlin, appearing himself in them in a starring capacity. His last and best play was *Der Verschwender* (1833), which is still popular on the German stage. Raimund, despondent, attempted suicide and died within a week. He was a genuine poet of the old Viennese folk play, who dwelt with affectionate sympathy upon the life of the people and wove its joys and sorrows into the fabric of fantastic dramas of peculiar charm. Their pathos and humor are alike telling. His life was made the subject of a novel by Otto Horn (Bäuerle) and of several dramatic productions. By the Raimund Dramatic Club, founded in Vienna in 1890, the Raimund Theatre was established there in 1893. His complete works were edited by Vogl (Vienna, 1837) in four volumes; by Glossy and Sauer (Vienna, 1881; 2d ed., 1891) in three volumes; and with biography by Castle (Leipzig, 1903) in three volumes. Consult: Frankl, *Zur Biographie Raimunds* (Vienna, 1884); article by Erich Schmidt in *Charakteristiken,* I (2d ed., Berlin, 1902); Aug. Sauer, in *Reden und Aufsätze* (Vienna, 1903).

RAIMUND, GOLO. See FREDERICH, BERTHA.

RAIN (AS. *regn, rēn,* Goth. *rign,* OHG. *regan,* Ger. *Regen,* rain; connected with Lat. *rigare,* Gk. *βρέχειν, brechein,* to wet). Drops of water formed in the atmosphere by the condensation of its aqueous vapor and falling rapidly by virtue of their weight. The very small drops that fall slowly are spoken of as mist, cloud, or fog. The largest drops of rain that have been measured are as much as 0.25 to

DISTRIBUTION OF RAINFALL OVER THE LANDS

MEAN ANNUAL



SCALE OF RAINFALL COLORING

The figures on the map represent inches.

0.30 inch in diameter and fall at the rate of from 15 to 25 feet per second. The smallest drops that are likely to be spoken of as rain are about $\frac{1}{20}$ inch in diameter and fall at the rate of about 5 feet per second. As rain water is condensed vapor that had previously been evaporated from distant water surfaces, therefore, in accordance with the laws of evaporation, it would be chemically pure water were it not for a small percentage of foreign substance which it gathers to itself from the atmosphere. Rain water washes down out of the air dust, soot, pollen, spores of fungi, and many other solid substances. Ordinary rain water contains an appreciable percentage of dissolved oxygen, nitrogen, ammonia, and carbonic-acid gas, and in special cases it is found to contain nitric acid, sulphuric acid, and other components of the impure air of cities. The acid and alkaline impurities generally increase the power of the rain water to dissolve the mineral constituents of the earth's crust; the gases make it possible for plants and animals to live in rivers and ponds, which would be impossible if the water were chemically pure. Rain water becomes wholesome potable water for man's use only after it has been thoroughly filtered through the earth, whence it issues as springs.

Up to the middle of the nineteenth century rain was supposed to be naturally formed by the mixture of cold and warm masses of moist air, but the publication of Espy's *Philosophy of Storms* (Boston, 1842) and his lifelong contention that cloud and rain are not due to cooling by mixture or by radiation, but are a consequence of the cooling of the atmosphere by virtue of the work done in expansion, supported as he was by Prof. Joseph Henry, Sir William Thomson (Lord Kelvin), and other physicists, finally led meteorologists to study the great thermodynamic problems of the atmosphere. When air is forcibly compressed, the work done by compression is represented by the increase in temperature of the confined air; vice versa when the air expands by diminution of pressure, the work done in expansion is represented by the heat abstracted from the expanding air, which therefore experiences a corresponding cooling. The laws of convective equilibrium governing the temperature and the volume of a unit mass of rising air were first expressed in the exact language of mathematical physics by Sir William Thomson in 1861. Graphic methods of treating the complex meteorological problems were devised by Hertz in 1884 and improved by Von Bezold in 1888 and Neuhoff in 1900. The analytical treatment of the subject is given by F. H. Bigelow with convenient tables in his report of 1900 *On the International Observations of Clouds.* When warm moist air ascends from near the earth's surface it cools by expansion; if no heat is added or subtracted it is said to cool adiabatically, and does so at the rate of about 1 degree Centigrade per 100 meters of ascent, or 1 degree Fahrenheit for 182 feet, until it reaches an altitude at which its temperature is the same as the temperature of the dew point of the original air. At and above this elevation cloud is formed as the air ascends. If the rise continues until the air has cooled to the temperature of freezing point of water, then the watery cloud particles begin to change to ice, giving out their latent heat as they do so without further lowering of temperature until in the course of its further ascent all the cloud particles have become ice; then any additional rise will be accompanied by further lowering of temperature and by the formation of snow crystals. This latter condition would continue to exist throughout the further ascent of the air were it not that in these higher regions the formation of snow is very slight. If the sun is shining upon the clouds the process ceases to be adiabatic, and the particles of water or ice may be immediately evaporated back into vapor. Owing to the resistance of the air the cloud particles fall very slowly to the ground, or may, in fact, be upheld indefinitely by a gentle ascending current. But if numerous small particles combine together into drops of water, the latter may fall rapidly to the ground as rain. The above paragraph correctly explains the formation of cloud by cooling due to expansion, but nothing is as yet known satisfactorily as to the process by which large raindrops are formed from the minute cloud particles.

Among the several plausible hypotheses are the following: (*a*) That the cloud particles are jostled together by currents of air or that the larger ones fall fast enough to overtake the smaller ones, so that in either case larger particles are formed which, as they descend, grow by the accretion of small particles that lie in their path. (*b*) That some of the smaller particles are positively and others negatively electrified and consequently by attraction are made to coalesce. (*c*) That some particles, being larger than others, have different surface tensions and that the larger ones are thereby enabled to grow at the expense of the smaller ones. (*d*) That the original cloud particles consist of vapor that has condensed upon particles of dust or foreign substances in the air and that this condensation takes place more readily upon some nuclei than others, as is known to be the case from the observations of Wilson, Aitken, Barus, and others. (*e*) That the atmosphere within a cloud, being saturated, has no remaining nuclei upon which condensation can take place, and as the air continues to rise and cool it comes to a state of supersaturation and intense molecular strain, which is finally relieved by a violent condensation upon groups of cloud particles already existing; this violent condensation takes place in such a way as to sweep many of the smaller cloud particles together into one large drop. C. T. R. Wilson has shown that these larger drops can be formed only when the air in the dustless cloud has been expanded and cooled at least one-third more than is required for ordinary dusty air. (*f*) Wilson has shown the plausibility of a slight modification of the preceding method; he finds that dustless air virtually acquires new nuclei on which condensation takes place when a beam of ultra-violet light or of the Röntgen rays, the radiation from uranium, or even ordinary sunlight, passes through the moist air, that in fact such nuclei are being formed in it all the time.

Prof. J. J. Thomson's observations on the formations of ions—viz., the breaking away from a molecule of some one of its integral components which he calls corpuscles—suggest that the atmospheric ions thus formed are active in producing cloudy condensation and that the negative ions attract moisture to themselves more readily than the positive, therefore they grow to be larger drops and, descending to the earth with their negative charges, give it negative electricity, while the atmosphere is left essentially positive.

Geographical Distribution of Rain. From the preceding section it is readily seen that the distribution of rain over the earth's surface must depend upon the influences that force air to ascend rapidly. Thus, on warm clear days, when the surface of the ground or water is highly heated, the lower stratum of air acquires a decided upward motion by reason of its buoyancy. Masses of hot air are rising while the cooler air near by is descending. Thunderstorms are usually formed in this way, and nearly every station in the torrid and temperate zones has a preponderance of local rains in the afternoon. Whenever an ocean breeze or a monsoon wind rises high enough on a mountain side it gives rise to cloud and rain, so that the ocean winds bring more rain than the land breezes. The finest illustrations of this principle are seen in the rains of the southwest monsoon in India, in the rains that fall with southwest winds on the coast of Europe, or in the southerly winds with rain on the Gulf coasts of the United States. Again, when a moist warm wind meets a cold dry wind, the latter generally flows under and lifts up the former, because of the greater density of the cold air compared with the warm. Therefore above the cold air is formed a layer of cloud and oftentimes of rain, owing to the rapid elevation of the warm air. Illustrations of this are to be found on the southeast and southwest sides of the areas of low pressure that pass eastward over the United States throughout the year and especially in the winter season. From the preceding it follows (1) that every rising slope, whether of mountain ranges or interior plains, should, other things being equal, show a greater rainfall as we proceed up the slope, and this distribution of rainfall with altitude has been found to agree with observations in Great Britain, Germany, India, the East Indies, and the United States; (2) considering the world at large, the heavier rainfalls should occur in regions where warm moist winds steadily impinge upon the mountain slopes. The above principles are exemplified in the rainfall charts contained in Bartholomew's *Physical Atlas* (London, 1899), and especially in the 26 maps showing the monthly and annual distribution of the rainfall on the land surface throughout the globe compiled by A. J. Herbertson and published by the Royal Geographical Society of London in 1900. Herbertson's charts of annual rainfall on the land surfaces are reproduced herewith.

Seasonal Distribution of Rain. This is in many respects more important than the total annual quantity. It is the combination of rainfall, temperature, and sunshine that determines the character of the vegetation in each part of the globe. In the Northern Hemisphere some stations have a large rainfall in June and July, when the sun is nearly overhead; but other stations have the minimum rainfall at this season. In the tropics most stations have two minima and two maxima of rainfall during the year. In the Southern Hemisphere, where the sun has its maximum power in December or January, even greater diversities appear. The growth of the perennial vegetation, and especially the annual plants and the important crops, are entirely controlled by these relations of sunshine and rain. In regions where the rainfall is insufficient to perfect the important grain crops, recourse must be had to irrigation, the success of which again depends upon the annual distribution of snow and rain.

Various types of rain prevail over the ocean as well as over the land, although, unfortunately, we have but very few measurements of the actual rainfall at sea and must, therefore, speak only of the frequency of the rain. Thus, on the Atlantic and Pacific oceans, under or near the equator, is a rainy belt where the pressure is always low, the winds exceedingly light, variable or calm; here the sun almost invariably rises in a clear sky, but about midday clouds begin to gather, and in a short time the whole face of the sky is covered with dark clouds which pour down prodigious quantities of rain. Towards evening the clouds disappear, the sun sets in a clear sky, and the nights are serene and fine. In lat. 25° N. to 35° N. on both Atlantic and Pacific there is a region of northeast trade winds in which the rainfall is comparatively light and occurs equally in all parts of the earth.

The details of the distribution of rainfall in the United States are given by Prof. A. J. Henry in his "Rainfall of the United States," *Weather Bureau Bulletin D* (Washington, 1897); in the article "Rainfall and Charts of Rainfall," in the *Monthly Weather Review* (ib., April, 1902); and particularly by B. C. Wallis in the *Monthly Weather Review* (ib., January, April, and June, 1915).

RAIN BIRD. Any bird popularly believed to foretell rain. Many of these birds are cuckoos. Both the North American species have this reputation, as have also the black anis of Mexico and southward, which are frequently called rain crows. In the middle western portion of the United States the bird commonly called rain crow is the yellow-billed cuckoo. The East Indian cuckoos, called koels (see Koel), have the same reputation and are commonly known in India and the Malay countries as rain birds and foretellers. To what extent this repute is justified is a question admitting of discussion. Birds, as well as other animals, are no doubt sensitive to changes in the temperature and humidity of the air, and some may be quick to recognize that certain of these changes portend disagreeable weather. The immediate effect or their anticipations may lead them to make outcries indicative of discomfort or alarm. A great variety of information and folk sayings on this subject is given in Dunwoody's "Weather Proverbs," *Signal Service Notes*, No. ix, published by the War Department (Washington, 1883). For Oriental superstitions, see *Ibis* (London, 1879).

RAIN'BOW (AS. *regnboga, rēnboga;* OHG. *regan-bogo;* Ger. *Regenbogen*). The name of the arc of prismatic colors which at times is seen when the sun or the moon is shining while it is raining. It always is seen in the part of the heavens opposite to the sun, and is high when the sun is low, and low, near the horizon, when the sun is high. It is a short arc, or a complete one resting on the earth at each end, according to the extent of the rain. Sometimes a second concentric bow is seen with the colors reversed. Both are due to the reflection and refraction of the rays of the sun in the drops of rain.

If the parallel lines S, Fig. 1, represent rays coming from the sun and falling upon the drop of water, the centre of which is O, it is possible to determine the path of each ray by applying the simple law of refraction. For example: the ray SB will be refracted to A, reflected to C, and finally refracted out to T. The parts of the ray which are reflected out at B, refracted out at A, or reflected in at C, need not be considered, as they do not contribute to the phenomenon. It may be shown that when the arc BA and AC are equal, then the angle between SB and CT is greater than for any other case. In other words, when the ray passes through the drop symmetrically, the final direction of the ray is at the greatest angle with the original direction, and also that a greater proportion of the total light falling on the drop is sent out in this direction than in any other. The light which falls farther out on the drop than B is mostly reflected off the drop, and that which falls nearer than B enters the drop, but mostly passes out at the back at A. Inasmuch as the index of refraction is different for the different-colored lights, it follows that the angle between SB and CT must be different for the different colors, less for violet than for red. An eye at T, Fig. 2, looking towards the drop, would see considerable of the light coming in the direction CT, but an eye at E_1 would see only a little light corresponding to the ray $SB_2A_2C_2T_2$, and an eye at E_2 would see no light from that drop. If we imagine the whole of Fig. 2 revolved upon the line TS' as an axis, then the ray SB becomes a cylindrical shell of rays, the drop becomes a circular arc of drops, and the ray CT becomes a conical shell of rays, which, seen by the eye at T, appears as a ring of light against the clouds as a background, having an angular radius equal to CTS'. If the red rays are considered this radius would be about 42° 22′, for the violet rays 40° 35′, and for the intervening colors it would have corresponding values. Thus, the ring of violet would appear the smallest and the red the largest, with the other colors ranged between. Of course, a particular drop is in the right position to contribute to this ring of light for only a small fraction of a second, but others take its place. Moreover, the apparent diameter of the sun causes a widening of the line of light to a band, and these bands of different colors overlap and blend. The bow formed as above described is called the primary bow and is much brighter than the secondary bow, which is formed as follows: by a line of reasoning entirely analogous to that given above it may be shown that light falling upon the opposite half of the drop, as shown in Fig. 3, may undergo two reflections in the drop and emerge in the direction DT. Again, when the path is symmetrical in the drop, the angle between SB and DT is now smaller than for any other case, but larger for violet than for red, and in all cases larger than the angle between SB and CT in the primary bow. Applying a similar consideration to Fig. 4 and considering it revolved upon the line TS' as an axis, it will be seen that colored bands of light will be seen by the eye at T of an angular diameter greater than any in the primary bow, and with the violet having the largest and the red the smallest diameter. The angular radius of the red is about 50° 24′ and of the violet 53° 22′. The values of the diameters were calculated by Airy and experimentally verified by Miller. When the conditions are very favorable other fainter bows may be seen inside the primary and outside the secondary bow. These correspond to a still

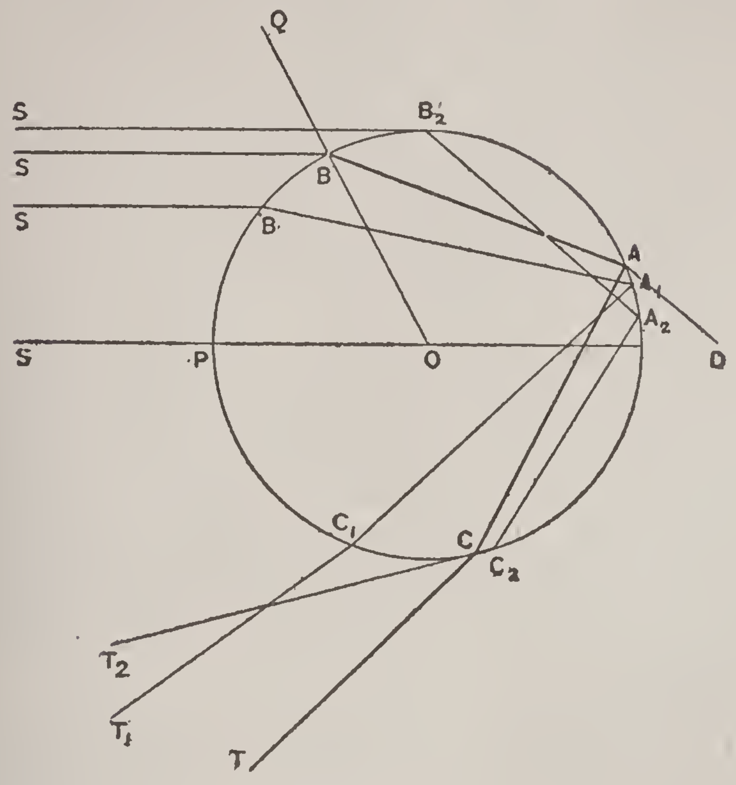


Fig. 1.

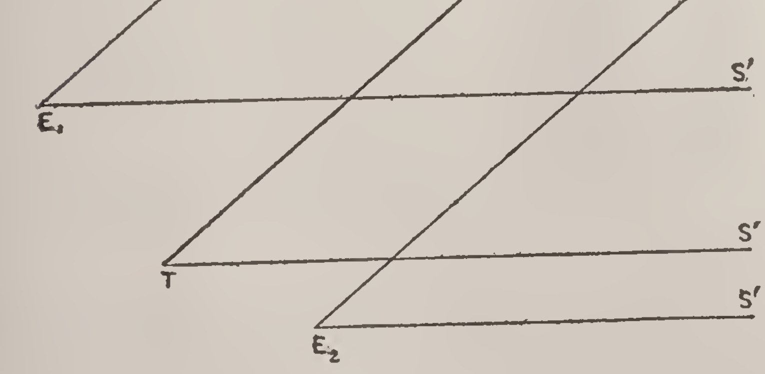


Fig. 2.

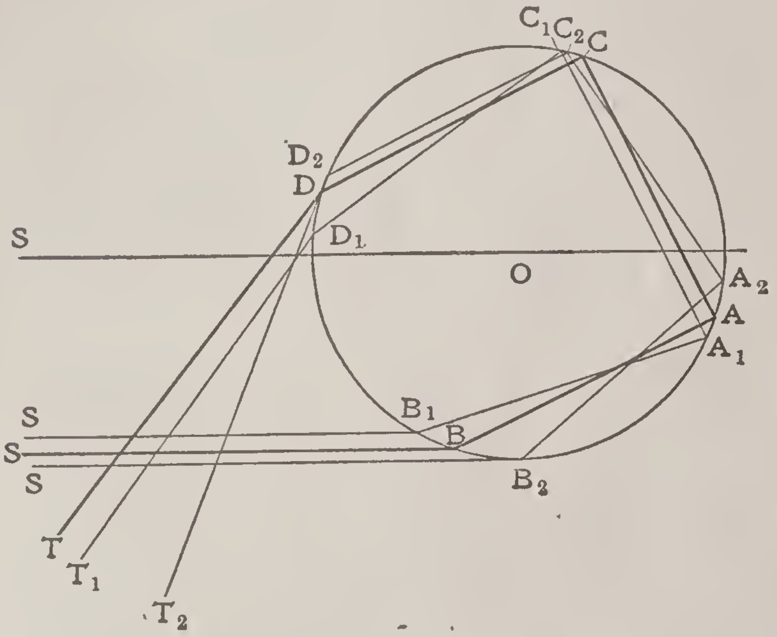


Fig. 3.

more complex combination of reflections and refractions of the rays in the drops. A lunar rainbow differs from a solar bow only in the intensity of the light and consequent paleness of the colors.

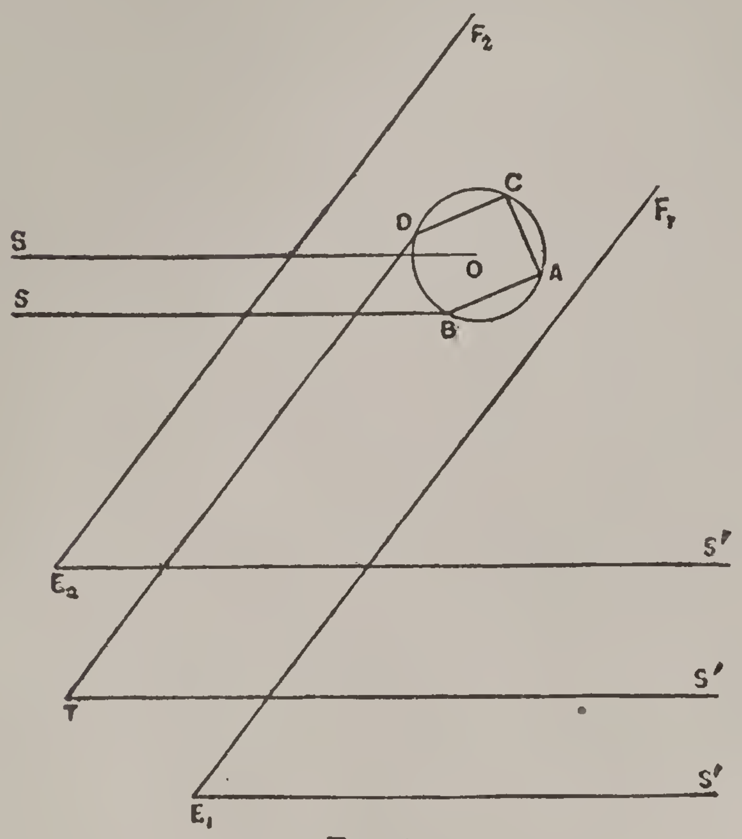


Fig. 4.

RAINBOW BIBLE. See Polychrome Bible.

RAINBOW FALLS. A cataract in the State of Washington. See Chelan, Lake.

RAINBOW TROUT. The trout of the coast ranges of the Pacific coast, from central California northward to Puget Sound, which takes its name (*Salmo irideus*) from the large, brilliant spots scattered over its bluish-silvery body. See Trout; and Plate of Trout and Grayling.

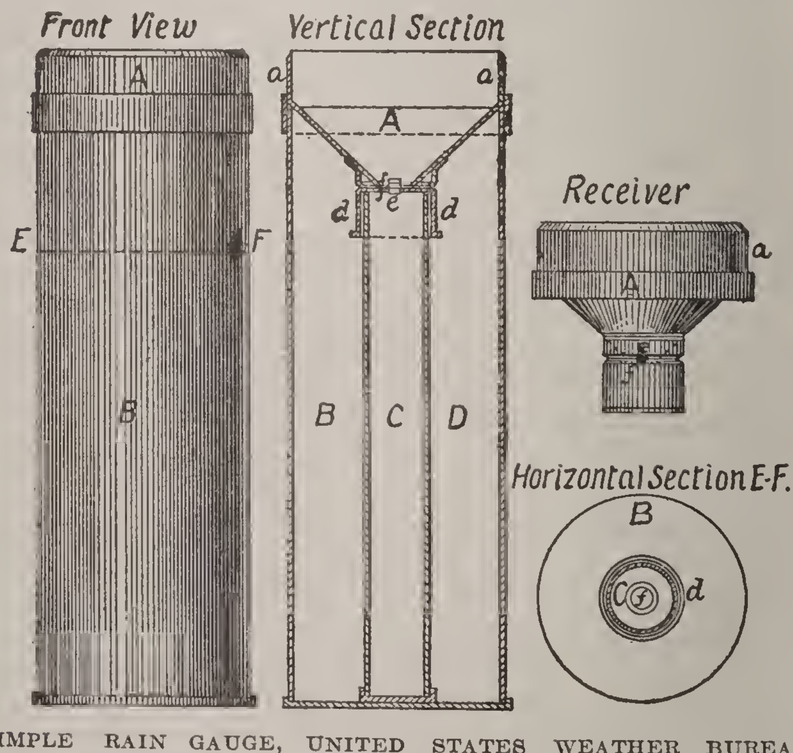
RAIN CROW. See Ani; and Plate of Cuckoos.

RAINES, John (1840–1909). An American politician, born at Geneva, N. Y. Graduating (1861) from the Albany Law School, he practiced at Geneva from 1863 to 1867 and thereafter at Canandaigua, N. Y. He served as a member of the State Assembly in 1881–82 and in 1885 and as State Senator in 1886–89, and after serving in the Fifty-first and Fifty-second Congresses (1889–93) was again a member of the State Senate from 1895 until his death, serving as its President pro tempore in 1902–09. Though a Republican in politics he formed an alliance with Democratic Senators in order to defeat Governor Hughes's reform measures. He is chiefly remembered as the author of the Raines Law. See Raines Law Hotels.

RAINES LAW HOTELS. In 1896 a law, the author of which was John Raines (q.v.), was passed by the Legislature of New York State, providing that no liquor should be sold anywhere in the State on Sunday except in a licensed hotel having not fewer than 10 bedrooms. Many saloon keepers attached bedrooms in order to sell liquor on Sunday; their places became known as Raines Law Hotels, and in many cases gained the reputation of being disorderly houses. This condition was investigated in 1905 by a committee of fourteen, and the result was that such hotels were reduced in number from 1400 to 750. The law was amended, forcing those seeking a license to conform to the municipal requirements for hotel buildings.

RAIN′EY, Paul J. (?–   ). An American explorer and hunter. The possessor of a large fortune, Rainey devoted much attention to sport. He hunted grizzly bears in the Rocky Mountains, and after his return from an Arctic expedition (1909), presented to the New York Zoölogical Park two polar bears, a musk ox, seven Eskimo dogs, and a blue fox. During a hunt in Africa, where he covered practically the same route through British East Africa as Colonel Roosevelt, he shot 74 lions in 1910. He took moving-picture films with him on both expeditions, and succeeded in obtaining a complete photographic record of a lion hunt and also films of a rhinoceros fight, and of baboons, cheetahs, giraffes, hyenas, jackals, and ostriches in the natural surroundings. When exhibited in New York, London, and other cities his pictures made a sensation. In 1914 Rainey started on another hunting trip in Africa and India and later exhibited more pictures. He contributed articles on his hunts to the New York *World*, the *Scientific American Supplement*, *Cosmopolitan*, and *Outing*.

RAIN GAUGE. An apparatus to catch the rain and measure its equivalent depth on the ground at any place. The simplest rain gauge consists of a vertical cylinder, into which one may dip a graduated stick and read off the depth of the collected water. Such an instrument, illustrated in the accompanying figure, is furnished by the United States Weather Bureau to its voluntary observers. Other gauges consist essentially of funnels to catch the water, glass bottles to hold it, and slender graduated glass tubes by which to make minute measurements. Self-registering gauges are now made so economically that they are always to be recommended. Those of the simplest pattern employ a tipping bucket, divided into two equal compartments and tipping to the right and left alternately, according as the right or left compartment is filled. Each tip corresponds to a definite depth, such as a hundredth of an inch. Another favorite form consists essentially of a weighing machine, and every ounce of rain, or the equivalent depth, is properly recorded on a sheet of paper moved by clockwork. Both forms, as perfected by Prof. C. F. Marvin, are used by the United States Weather Bureau.



SIMPLE RAIN GAUGE, UNITED STATES WEATHER BUREAU PATTERN.

The great value of exact data of rainfall and snowfall in remote unsettled mountain regions in which are often located the headwaters of important waterways or sources of irrigation water has created a demand for a so-called seasonal gauge. Such a gauge must stand all the vicissitudes of exposure in severe weather, the alternations of freezing and thawing, and withal catch and retain for measurement the precipitation in all forms for a month or a season. Satisfactory gauges of this character are not yet available. A gauge devised to keep continuous record for a month is described in the *Monthly Weather Review* (Washington, January, 1915).

It has long been known (since Heberden, 1776) that perfectly reliable gauges collect less rain the greater their height above ground, and it is now satisfactorily demonstrated that this is entirely due to the fact that the gauge causes eddies of wind around and even within its mouth. These eddies carry away the smaller particles of rain or snow to a greater or less extent. On the average of all records that have been made in Europe and America and in all kinds of rain, the deficit of rain recorded by the gauge has been found to increase in proportion to the square root of the altitude above ground. Consequently the correct rainfall can be approximately determined if the observer notes the difference between the catches of two or more similar gauges set at different altitudes above the ground. When a gauge is set up within a shallow saucer-like depression in the ground so that the mouth of the gauge is level with the earth beyond the edges of the pit, or when it is placed on the flat roof of a building and protected on all sides by a high balustrade, good measurements are also obtained. Most elaborate investigations into the peculiarities of rain gauges are published in the annual volumes of Symons, *British Rainfall* (London). For other special studies, see the works of Eastman, United States Naval Observatory; Hellman (Berlin, 1890); Abbe (Washington, 1887, 1892); Boernstein (St. Petersburg, 1890); E. Berg (St. Petersburg, 1870).

RAINIER, rā-nēr′, Mount, or Mount Tacoma. One of the highest peaks of the United States, exceeded south of Alaska only by Mount Whitney. It is a regular volcanic cone rising from the Cascade Range in the southwestern part of the State of Washington to a height of 10,000 feet above its immediate surroundings and 14,408 feet above the sea (Map: Washington, D 4). Although its crater still emits sulphurous fumes, it is to be regarded as extinct, since the deeply eroded slopes of the mountain show that the last eruption must have occurred at a remote period. The lower slopes are densely forested, but the higher portion carries a series of 14 glaciers, the largest in the United States south of Alaska.

RAINOLDS, rĕn′olz, or **REYNOLDS**, John (1549–1607). An English biblical scholar. He was born at Pinhoe, near Exeter, graduated B.A. at Corpus Christi College, Oxford, in 1568, and became tutor to Richard Hooker. He was afterward (1572–78) reader in Greek at the university. He distinguished himself as a zealous Protestant. In 1593 he was made dean of Lincoln, and from 1598 he was president of Corpus Christi. Rainolds's greatest distinction is the part he took in the Hampton Court Conference (q.v.) and his connection with the translation of the Bible. It was he who urged upon the King the necessity of the latter work, and he occupied a prominent place among the translators; his company was that to which the prophets were assigned.

RAINS, rānz, George Washington (1817–98). An American soldier and chemist, born in Craven Co., N. C. He graduated in 1842 at the United States Military Academy and was an instructor there in 1844–46. He served in the Mexican War, was brevetted major for gallant conduct and in 1849–50 fought against the Seminoles. Promoted in 1856 to be captain, he resigned in the same year and in 1861 entered the Confederate army as colonel. He erected the Confederate powder mill at Augusta, Ga., and was promoted to be brigadier general. From 1867 he was professor of chemistry and pharmacy in the University of Georgia and until 1884 was dean of the faculty. He published: *Steam Portable Engines* (1860); *Rudimentary Course of Analytical and Applied Chemistry* (1872); *Chemical Qualitative Analysis* (1879).

RAINS′FORD, William Stephen (1850–). An American Protestant Episcopal clergyman, born in Dublin, Ireland. He took his degree at St. John's College, Cambridge, in 1872, and then was curate of St. Giles's Church, Norwich, until 1876. In this year he came to the United States to take part in gospel-tent meetings in New York. Subsequently he conducted evangelistic services in other cities of the United States, in London, and in Canada, and from 1878 to 1882 was assistant rector of St. James' Cathedral, Toronto. From 1883 till his resignation in 1906 he was rector of St. George's Church, New York, which under his direction developed great institutional activity. After his retirement from the ministry Rainsford became known as an African lion hunter, his experiences being recounted in *The Land of the Lion* (1909). In the field of religious literature he published: *Good Friday Meditations* (1901); *The Reasonableness of Faith, and Other Addresses* (1902); *A Preacher's Story of his Work* (1904); *The Reasonableness of the Religion of Jesus* (1913).

RAINY, rā′nĭ, Robert (1826–1906). A Scottish divine and scholar, born in Glasgow. Educated at Glasgow University and at New College, Edinburgh, he became minister of the Free Church at Huntly in Aberdeenshire (1851–54) and of the Free High Church in Edinburgh (1854–62). After serving for 12 years as professor of Church history in Free Church College, Edinburgh, he was elected principal (1874). He was active in the reorganization of the United Free church, made necessary by the decision of the House of Lords, in 1904, depriving the church of its property. Among his publications are: *Three Lectures on the Church of Scotland* (1872; often reprinted); *The Bible and Criticism* (1878); *Presbyterianism, a Form of Church Life and Doctrine* (1894); *The Ancient Catholic Church* (1902). Consult the *Life* by P. Simpson (Edinburgh, 1909).

RAINY LAKE. A lake forming part of the boundary line between Canada and the State of Minnesota and situated 160 miles west of Lake Superior (Map: Ontario, N 13). It is a very picturesque sheet of water, nearly 50 miles long and 5 miles in average breadth. Its surplus waters are drained into the Lake of the Woods (q.v.) by the Rainy River.

RAIS, rȧ, or **RETZ,** rĕs; *Eng.* rĕts, GILLES DE. See BLUEBEARD.

RAI SANYO, rī sän′yȯ (1780–1833). A Japanese author and historian, who, in 1827, after sifting 650 native books in 20 years of continuous labor, published in 22 volumes his great work, the *Nihon-Guaishi.* It is written in Chinese and tells the story of the domination of the Empire by the military class from the twelfth century onward, picturing the rise of those military clans, the Taira and Minamoto, that usurped the power of the Mikado, and ending with the establishment of the Tokugawa shogunate in the early part of the seventeenth century. In his other work, the *Nihon Sćiki,* also in Chinese, published posthumously, Rai sketches in 16 volumes the history of Japan from 660 B.C. to 1596 A.D., discussing the character and conduct of each sovereign in turn. The effect of these writings was to educate the Japanese Samurai (q.v.) into a bitter hatred of the Shogun and to set forward the revolution of 1868. The name of Rai Sanyo is cut upon the walls of the Boston Public Library as one of the great names in the world's literature. Five books of the *Nihon-Guaishi* were later translated into English in 1872 by Satow (q.v.), British Minister to Japan and afterward Minister to China. Consult B. H. Chamberlain, *Things Japanese* (New York, 1891), and W. G. Aston, *History of Japanese Literature* (ib., 1901).

RAISED BEACHES. See BEACHES, RAISED.

RAISINS (OF. *raisin, reisin,* Fr. *raisin,* It. *racemo,* grape, dried grape, cluster of grapes, from Lat. *racemus,* cluster of grapes; connected with Gk. *ῥάξ, rhax,* berry). The dried fruit of the grape. Raisin grapes are usually the product of warm climates and contain from 28 to 30 per cent of sugar. They are for the most part dried in the sun, and as this requires several weeks of practically rainless weather, the areas of commercial culture are limited to a few countries about the Mediterranean Sea, South Australia, and in the Western Hemisphere to southern California and Chile. The principal and most valuable class of raisins is the muscatel or muscat from Malaga and Valencia in Spain and from California. The seedless raisins of commerce are largely the product of the sultana grapes. The Thompson seedless, which is a promising seedless raisin grape in California, produces raisins a little larger than the sultana. The smallest raisins come from the small currant grape, originally from Corinth. The small black currant of Zante belongs to this class. (See CURRANT.) In the sun curing of standard raisins in California the bunches of grapes are picked by the stems and, all imperfect berries, dirt, etc., having been removed, laid in trays slightly raised so as to incline towards the sun. When about two-thirds dry, which will be at the end of six to eight days, they are turned by placing an empty tray over the filled one and inverting both. The upper or original tray is then removed and the grapes exposed four or five days longer for further drying. At the end of this time the grapes are stored and put through a sweating process of from 15 to 20 days, when they are ready for packing. Sometimes the drying is done entirely in drying houses. In the Mediterranean districts the stems of the ripened bunches are sometimes partially cut and the sun drying begun on the vines. Another method of curing is to dip the bunches into a hot solution of potash lye to which has been added a little salt and olive oil. This method is practiced much more in Europe and Asia Minor than in California. Some of the best raisins of commerce are thus treated. The raisin industry in California has developed rapidly. In 1912 the production amounted to 190,000,000 pounds. Consult Eisen, *The Raisin Industry* (San Francisco, 1890), and G. C. F. Husmann, *Grape, Raisin, and Wine Production in the United States* (Washington, 1902).

RAISULI, rī-sōō′lē̇ (ACHMED BEN MOHAMMED ER RAISUNI, rī-sōō′nē̇) (c.1875–   ). A Moroccan bandit, in rank a shereef, or noble descendant of the Prophet. He was born in Tetuan of Berber stock. It was in 1904 that Raisuli became famous for the kidnaping of Ion Perdicaris, a naturalized American. By this act he forced the Sultan to restore his honors and property, of which he had been deprived, and to pay $70,000 ransom, the United States compelling the Sultan to comply with Raisuli's demands. Raisuli had formerly kidnaped Walter Harris, the wealthy London *Times* correspondent in Tangier, and had held him for ransom. In 1907 Kaid Sir Harry Maclean, the Sultan's military instructor, became Raisuli's third captive. For Maclean's release Raisuli demanded and received the governorship of the entire Fassi district, £20,000 cash, large quantities of arms and ammunition, and a promise that his fortress at Zinat should be rebuilt. Later he had to return £15,000 and the Sultan of Morocco £5000. Raisuli was for a time a British subject. Under Raisuli's governorship order was reëstablished in the Fahs, and yet reports persisted of his attempted revolts against higher authority, and at least twice he was reported as certainly dead, the statement being withdrawn each time.

RAJAH, rä′jȧ (Skt. *rājan,* king; akin to Lat. *rex*). Originally a title of those princes of Hindu race who, whether independent or not, governed a territory. It subsequently became a title given by the native governments, and in later times by the British government, to Hindus of rank, and it is now not uncommonly assumed by zemindars or landholders. Other forms are *ras, rana,* and *rawal,* and in Hindustani *rai.* The native princes now frequently assume the title of Maharajah, or great King. According to the ancient social system of India, the rajah belonged to the Kshatriya, or military caste (see CASTE), although the title is now also given to or assumed by members of inferior castes. Consult Foy, *Die königliche Gewalt nach den altindischen Rechtsbüchern* (Leipzig, 1895), and Jolly, *Recht und Sitte* (Strassburg, 1896).

RĀJAŚEKHARA, rä′jȧ-shā′k'hȧ-rȧ (c.900 A.D.). A Sanskrit dramatist. He seems to have been born in the Deccan, doubtless in the region about Vidarbha and Kuntala, whence he came to the court of Mahendrapala, King of Kanauj. He was a Brahman, and his wife, Avantisundari, was a Rajput princess. Four plays are ascribed to Rājaśekhara. The first is a drama in four acts, entirely in Prakrit (q.v.), entitled *Karpūramañjarī* (Cluster of Camphor Blossoms). It was edited by Vamanacarya (Benares, 1872) and, together with the *Bālabhārata,* by Durgaprasad and Parab (Bombay, 1887), and with an admirable English translation, glossary, and account of the author by Konow and Lanman (Cambridge, Mass., 1901). The second drama is the *Viddhaśālabhañjikā* (Pierced Statue), also in four acts, which much resembles in plot the *Karpūramañjarī*. It has been edited by Vamanacarya (Benares, 1871), by Vidyasagara (Calcutta, 1873; 2d ed., ib., 1883), and by Arte (Bombay, 1886). The remaining plays are based on the two great epics of India, the *Rāmāyana* (q.v.) and the *Mahābhārata* (q.v.). Of these dramas the *Bālarāmāyaṇā* (Exploits of Balarana), in 10 acts, is the more important. It was edited by Sastri (Benares, 1869) and by Vidyasagara (Calcutta, 1884). The last play, the *Bālabhārata* or *Prachandapāndava* (the Wrathful Sons of Pandu), in only two acts, seems to be incomplete. It has been edited by Cappeller (Strassburg, 1885). Consult Apte, *Rājaśekhara: His Life and Writings* (Bombay, 1886).

RĀJATARAÑGINĪ, rä′jȧ-tȧ-rän′gė-nė (Skt., river of kings). A work of the Kashmirian poet and historian Kalhana. In eight cantos with a total of about 8000 verses, or slokas, it tells the histories of the various dynasties which ruled Kashmir from the earliest (mythic) period down to the time of the author. Kalhana describes himself as the son of Campaka, the minister of the famous King Harsha, who ruled from 1089 to 1101. The history was written between 1148 and 1150 under the reign of Sinhadeva. Kalhana's chronicle is practically the sole extant work of a truly historical character in the entire range of Indian literature. He reports that he studied 11 historical works, but not content with that, he examined old documents, grants, proclamations, laws, and sacred books. He is especially well acquainted with the great epic, the *Mahābhārata* (q.v.), which he cites frequently. Above all he has the gift of character portrayal. The historians whom Kalhana mentions as his predecessors are all lost, so that the *Rājatarañginī* is the chief and direct source of information on the ancient history of Kashmir. The first three cantos, which deal with the first two dynasties, are almost wholly legendary. Stein published a critical edition of the text at Bombay in 1892 and a translation in two volumes, with an introduction, commentary, and appendices, at Westminster in 1900. There is also a translation by Y. C. Datta (Calcutta, 1898).

RAJENDRALALA MITRA, rȧ-jĕn′drȧ-lä′lȧ mē′trȧ, RAJAH (1824–91). An Indian Orientalist, born near Calcutta. He early devoted himself to historical and philological research, became librarian of the Bengal Asiatic Society in 1846, its vice president (1861–85), and its president in 1885. In 1878 he was granted the Order of Companion of the Indian Empire. To the *Journal* of the society he contributed many valuable papers. But he was better known for his *Notices of Sanskrit MSS.* (10 vols., 1871); *Antiquities of Orissa* (2 vols., 1875–80); *Buddha Gayá* (1878); *Indo-Aryans* (1881); and the *Sanskrit Buddhist Literature of Nepal* (1882), in which he showed special skill in deducing history from artistic and architectural remains. He was also engaged in the translation of Cākya-Sinha's *Lalita-Vistara* (q.v.) from 1881 to 1896, edited the *Twelve Principal Upanishads* (1891), and contributed more than 80 articles to the *Bibliotheca Indica*.

RAJKOT, räj′kōt′. A town and railway station, capital of a Gujarat native state of the same name, on the Kathiawar peninsula, Bombay, India, 110 miles west of Cambay (Map: India, B 4). It has several educational institutions, including a Rajkumar college for native princes, and there is a bridge of some merit spanning the Aji River. Pop., with cantonment, 1901, 27,159; 1911, 26,412.

RAJNA, rī′nȧ, PIO (1847–). An Italian philologist, born at Sondrio and educated at Pisa. He taught in *licei* at Modena and Milan and in 1883 became professor of Romance philology at the Florence School for Higher Studies. His works include: *Ricerche intorno ai reali di Francia* (1872); *Le fonti dell' Orlando Furioso* (1876); *Le origini dell' epopea francese* (1884, winning the Diez prize); an edition of Dante's *De Vulgari Eloquentia* (1896, 1897). Consult for complete bibliography, *Studi letterari e linguistici dedicati a Pio Rajna* (Florence, 1911).

RAJON, rȧ′zhôɴ′, PAUL ADOLPHE (1844–88). A French etcher. He was born in Dijon and studied painting with Pils and etching with Bracquemond. His own style is distinguished by great freedom, delicacy, and precision. In 1873 he went to England, where he afterward passed part of each year, and shortly before his death he visited New York, where he received numerous commissions. His best plates are small and elaborate. They include the portraits of Mrs. Susan Rose, after Watts, and Darwin, after Ouless, his two masterpieces; "The Duel after the Masquerade," after Gérôme; "Man Reading," after Meissonier; "Salome," after Regnault; and "The Blue Boy," after Gainsborough. Rajon contributed powerfully to the great revival of etching in France. See Plate of TENNYSON. Consult Stephens, *Twelve Etchings by P. A. Rajon*, with a memoir (1889).

RAJPUTANA, räj′pōō-tä′nȧ (the country of the Rajputs). A territorial division of north-central India, officially called Rajputana Agency, consisting of 18 native states and two chiefships (Map: India, B 3). Rajputana entirely surrounds the small British province of Ajmer-Merwara. The area of Rajputana is 128,987 square miles. The country comprises two distinct physical divisions, formed by the Aravalli Hills, which intersect it in a northeast and southwest direction. The northwest portion contains about three-fifths of the area and is largely unproductive and sparsely populated; it includes much of the Thar, or Indian desert. Near the southwest end of the Aravallis is Mount Abu, whose principal peak, 5650 feet high, is the highest point between the Himalayas and the Nilgiris. The southeast division of Rajputana is more elevated than the northwest part and more fertile. It nevertheless contains much jungle and rugged rocky country. It is traversed by numerous streams, most of which reach the Jumna; the largest and most important is the Chambal, which flows through the country for about one-third of its course and forms the boundary for another third. The climate, in the main, is dry and very hot; the diurnal range of temperature is considerable, especially in the north, where in the winter frosts often occur at night. At Jaipur the mean temperature in January is 60.9° and in May 91.8°. The rainfall is very unequally distributed. In Jaisalmer and parts of Bikaner and Jodhpur the annual precipitation averages only about 6 or 7 inches. The country is subject to famine, due to the occasional failure of the southwest monsoon. The worst famines of which there is record were those of 1661–62, 1812–13, 1868–69, and 1899–1900.

The principal occupation of the people is agriculture and the raising of camels, cattle, and sheep. In most of the northwest portion the soil is too light and the rainfall too scanty for successful farming, and irrigation is not practicable, but live stock is raised in considerable numbers. In the southeast portion much better conditions obtain; here the principal crops are bajra (spiked millet) and jowar (great millet); other important crops are wheat, grain, barley, sesame, corn, and the poppy. There are also produced kidney beans, a coarse kind of rice, cotton, hemp, tobacco, indigo, etc. Some commerce is carried on with the surrounding regions. The length of railway in Rajputana (including that in Ajmer-Merwara) was 1576 miles in 1906. Several lines with branches traverse the country.

The population increased from 10,268,000 in 1881 to 12,401,000 in 1891. In the following decade were successive years of drought, with fever epidemics in 1892, 1899, and 1900 and the great famine in the latter year. The 1901 census returned a population of 9,853,366. The 1911 census showed 10,530,432 inhabitants (5,515,275 males, 5,015,157 females). Population by important religions in 1911: Hindu, 8,753,919; Mohammedan, 985,825; Jain, 332,397; animistic, 444,702. The Christians comprised 2548 Indians, 529 Eurasians, and 1179 Europeans. Population by language in 1911: Rajasthani (of which there are at least 16 real dialects), 8,297,636; Hindi, 1,190,083; Gujarati, 503,399; Western Hindi (which includes Hindustani, or Urdu), 434,852; others, 104,462. The principal towns, with 1911 population, are: Jaipur, 137,098; Jodhpur, 59,262; Bikaner, 55,826.

The 18 states and two chiefships comprising Rajputana are governed by their native rulers, most of whom are Rajputs, although only about 6 or 7 per cent of the population is Rajput. The government of India is represented by an officer styled the agent to the Governor-General, who is also the chief commissioner of the British Province of Ajmer-Merwara. The states and chiefships constitute eight political charges—three residencies and five agencies—under the superintendence of the Governor-General's agent. These charges are: Mewar Residency (comprising Udaipur, Banswara, Partabgarh, and Dungarpur), Western Rajputana States Agency (Jodhpur, Sirohi, and Jaisalmer), Jaipur Residency (Jaipur, Kishangarh, and the chiefship of Lawa), Haraoti and Tonk Agency (Tonk, Bundi, and the chiefship of Shahpura), Eastern Rajputana States Agency (Dholpur, Karauli, and Bharatpur), Kotah-Jhalawar Agency, Bikaner Agency, and Alwar Agency.

The several native tribes which occupied Rajputana were captured by the Mohammedans in the eleventh century. In the latter half of the sixteenth and during almost all of the seventeenth centuries they were under the sway of the Moguls. Then came a period of Mahratta rule, which lasted until the early part of the nineteenth century, when Rajputana came under the protection of the British Empire.

RAJPUTS, räj-po͞ots′ (Hind. *Rājpūt*, from Skt. *rājaputra*, prince, from *rājan*, king + *putra*, son). The Rajputs, from whom Rajputana, in north-central India, has received its name, number some 11,000,000. The name is an honorary one applied to a congeries of tribes and castes of diverse origin and customs. The Rajputs were originally the feudal conquerors of Western Hindustan. Despite their claim to be descendants of the ancient Hindu Kshatriya caste (see Caste), it is doubtful whether their Brahmanism is not, like other of their mental and physical qualities, a transferred character. The chief seat of the Rajputs is Rajputana, but they are also numerous in Gujarat, and were formerly powerful in Lower Sind. Consult Crooke, *Tribes and Castes of the Northwest Provinces and Oudh* (Calcutta, 1896); the *India Census Report*, vol. xxii (ib., 1911); J. Seesodia, *The Rajputs* (London, 1915).

RAJSHAHI, räj-shä′hē̇. A division of Bengal, British India, having an area of 17,356 square miles. It is divided into seven districts: Rajshahi, Dinajpur, Jalpaiguri, Darjeeling, Rangpur, Bogra, Pabna. Pop., 1911, 1,480,587.

RAKE'S PROGRESS, The. A series of eight paintings by Hogarth (1735), now in the Soane Museum and widely known through the engravings after them. They depict the career of a dissolute man of fashion of that day and are entitled: (1) "The Heir and his Property"; (2) "Surrounded by Artists"; (3) "Tavern Scene"; (4) "Arrest for Debt"; (5) "Marriage"; (6) "Gaming"; (7) "Prison"; (8) "Madhouse."

RAKI, rȧ′kē̇′ *or* răk′ē̇. See Arrack.

RÁKÓCZY, rä′kō-tsĭ. A Transylvanian family which played an important part in the affairs of Hungary during the seventeenth and eighteenth centuries. George I Rákóczy (1591–1648) became Prince of Transylvania in 1631. He married the heiress of the Báthory family, thereby acquiring immense riches. In alliance with the Swedes and the French he invaded Hungary in 1644 and succeeded in extorting new guarantees for Hungarian liberties in the Peace of Linz (1645).—A great grandson of George I was Francis II (1676–1735), Prince of Transylvania. His father, Francis I, was elected Prince of Transylvania, but never assumed the office, and died soon after his son's birth. Francis II was a Protestant, married a princess of Hesse, and in 1701 was imprisoned on an accusation of conspiracy to incite rebellion, but he escaped to Poland and headed an insurrection in Hungary against Leopold I (1703) at the time when that prince was engaged in the War of the Spanish Succession. He soon gained possession of Hungary and Transylvania, his operations being facilitated by subsidies obtained by Louis XIV. In 1705 the insurgent parts of Hungary united themselves in a confederation and placed Rákóczy at the head. He had previously been chosen Prince of Transylvania. In 1708 he was defeated by the Austrians; dissensions sprang up in the confederation, and during his absence in Poland (1711) a treaty of peace was negotiated between Austria and the confederation at Szatmár; but to this treaty Francis Rákóczy was never willing to accede. He lived in exile in France and Turkey and died at Rodosto, on the Sea of Marmora, April 8, 1735. Consult his *Mémoires sur les révolutions de Hongrie* (The Hague, 1739).

RÁKÓCZY MARCH. A military air by an unknown composer popularized by the army of

Francis Rákóczy II of Transylvania. The Hungarians adopted it as their national march, and, like the "Marseillaise" in France, it has been placed under the ban of the Austrian government at various periods of political excitement. The air most generally known in Germany and elsewhere out of Hungary as the Rákóczy March, which is introduced by Berlioz in his *Damnation de Faust*, is a weak paraphrase of the original version of Rucziska.

RÁKOSI, rä′kō-sē, Jenö (1842–). An Hungarian author, born at Acsád, Eisenburg County, and largely self-educated. At 21 he went to Budapest, became a contributor to the *Napló* when that journal was under the charge of Kemény, and in 1866 scored a great success with his comedy, *Æsop*. From 1875 to 1881 he was manager of the Hungarian popular theatre in Budapest and then founded the *Budapesti Hirlap*, a radical paper. His success with *Æsop* made him a leader of the younger literary circle. Among his later works are the tragedy *Andrew and Joanna*, dealing with the murder of Andrew of Anjou by Joanna I of Naples (1885); a study of the nature of tragedy (1886); a very realistic and Zolaesque drama entitled *Magdalene;* a novel, *The Greatest Fool;* and some dramas, comedies, and farces. His collected works in 20 volumes appeared in 1905.—His brother Victor (Sipulusz) (1860–) became popular as a humorist.

RAKSHASA, rŭk′shȧ-sȧ (Skt. *rakṣas, rakṣasa*, demon, probably from *rakṣ*, to injure). In Hindu mythology, the name of the principal class of demons or goblins that were supposed to infest the earth. The Rakshasas play an important part in the religion of India from the Vedic period to the present time. They may assume various shapes at will, as of dogs, vultures, owls, and other ill-omened creatures, or of human beings. When they assume human form they are occasionally beautiful, especially as women, but more often they are hideously malformed, with three heads, five feet, monstrous bellies, projecting teeth, crooked thighs, or with feet turned backward. Their special object of maleficence next to children is sacrificial worship, although they ever lurk to destroy the pious, especially by entering his body together with his food. The post-Vedic texts abound in tales of these demons, who there assume the vampire type. They are essentially nocturnal fiends, devourers of corpses and haunters of graveyards. Among themselves the Rakshasas have kingdoms and enormous wealth which they bestow generously on those who win their favor. They are therefore regarded as the attendants of Kubēra. They are constantly at war with the gods, but are routed by Vishnu (q.v.). The origin of these demons is uncertain. Some texts say they were either created by Brahma to guard the waters or were born from his foot, while other accounts call them the children of Pulastya or of Rakshas, son of Kasyapa. Consult: John Muir, *Original Sanskrit Texts*, vol. v (3d ed., London, 1884); Crooke, *Popular Religion and Folk-Lore of Northern India* (2d ed., ib., 1896); A. A. Macdonell, *Vedic Mythology* (Strassburg, 1897); W. J. Wilkins, *Hindu Mythology, Vedic and Purānic* (London, 1900).

RÂLE, räl. See Respiratory Sounds.

RÂLE, or **RASLE**, räl, Sébastien (1657–1724). A Jesuit missionary in North America. He was born in Franche-Comté Jan. 4, 1657, became a Jesuit novice at Dôle in 1675, taught at Carpentras and Nîmes, and in 1689 went to Canada as a missionary. He was stationed for two years at the Abnaki mission of St. Francis, near the mouth of the Chaudière, spent two years among the Illinois Indians, and from 1694 until his death was stationed among the Norridgewocks, near the present Norridgewock, Me. He learned the Abnaki language, acquired great influence over the Indians, and was believed by the English, apparently with good reason, to have been the instigator of the Indian attacks upon the English in this region which resulted in Dummer's War (q.v.). Retaliation by the English culminated (August, 1724) in the murder of Râle. Among Râle's papers carried off by the English was his dictionary of the Abnaki language, upon which he had been engaged for 30 years. The manuscript is preserved in the library of Harvard University. A number of Râle's letters are given in Thwaites (ed.), *Jesuit Relations* (Cleveland, 1903). Consult: Francis Parkman, *A Half Century of Conflict* (Boston, 1892); J. P. Baxter, *The Pioneers of New France in New England* (1894); J. F. Sprague, *Sebastian Rale: A Maine Tragedy of the Eighteenth Century* (Boston, 1906); N. E. Dionne, *Le Père Sébastien Rasle* (Quebec, 1911).

RALEGH, Sir Walter. See Raleigh.

RALEIGH, ra̤′lĭ. A city, the county seat of Wake County, and the capital of North Carolina, 203 miles northeast of Columbia, S. C., on the Southern, the Seaboard Air Line, and the Norfolk Southern railroads (Map: North Carolina, D 2). It is situated at an elevation of 363 feet and is regularly laid out. The many fine buildings include the State capitol, occupying a prominent site in a square near the city, Administration building, Governor's mansion, Museum and Hall of History, Agricultural and Mechanical College, Department of Agriculture building, State and Supreme Court libraries, Hospital for the Insane and Epileptics, the prison, poultry farm, Confederate Soldiers Home, School for White Blind, School for Negro Deaf Mutes and Blind, and buildings on the fair grounds and the Experiment Farm. Other prominent structures are the Rex, St. Agnes and Leonard hospitals, the municipal building, Federal building, Raney Library, Methodist and Roman Catholic orphanages, and the Country Club. Raleigh is noted for its educational institutions, which include, in addition to 14 public schools, the State College of Agriculture and Mechanic Arts, St. Mary's Peace and Meredith colleges for women, Shaw University (Baptist), and St. Augustine's Normal School and Collegiate Institute, both for negroes, and two business colleges. Of interest also are Pullen and Bloomsbury parks and the Confederate and National cemeteries.

Raleigh is a large cotton and tobacco market and is industrially important, its manufactures in 1909 having an invested capital of $2,027,000 and products valued at $2,376,000. The principal manufactures are cotton goods, yarns, hosiery, underwear, boilers, structural iron, agricultural implements, vehicles, cotton oil, fertilizers, house-building material, furniture, stationery, woodenware, and candy. The city has adopted the commission form of government. It is unique in that its public property and highways are owned by the State and not by the city. Pop., 1900, 13,643; 1910, 19,218; 1915 (U. S. est.), 19,980. The site of Raleigh was selected for the capital of the State in 1792 and in the same year the city was laid out and named in honor of Sir Walter Raleigh. In 1794 the Legislature met here for the first time, and by Acts of 1795 and 1803 Raleigh was incorporated. General Sherman occupied the city during a part of 1865. Consult Battle, *The Early History of Raleigh* (Raleigh, 1893).

RALEIGH, ra̤′lĭ, or **RALEGH**, Sir Walter (c.1552–1618). An English courtier, navigator, and explorer. He was the son of Walter Raleigh of Fardell, was born at East Budleigh, and studied for a year or two at Oriel College, Oxford. In 1569 he was in the Huguenot army at the battle of Jarnac, and he seems to have spent some five years in France. In 1577 he was among the hangers-on at court, and in 1578 he sailed with a small fleet belonging to his half brother, Sir Humphrey Gilbert, upon an alleged voyage of discovery, though the capture of Spanish galleons was probably the real object in view. During 1580–81 Raleigh was a captain in the Irish service and was a member of a commission for governing Munster. Upon his arrival at court with Irish dispatches in December, 1581, his handsome presence and address attracted the attention of Queen Elizabeth. Within a few years he had received appointments and grants which placed him among the most wealthy courtiers. As vice admiral of the western counties of England he was in constant touch with the buccaneering expeditions against Spain, which sailed under pretended commissions from the Prince of Condé or William of Orange. He invested heavily in Sir Humphrey Gilbert's unfortunate expedition to Newfoundland in 1583, and after the latter's death applied to the Queen for a continuation of his patent. The privileges obtained entitled him to fit out expeditions for a period of six years and to take possession of unknown lands in the name of the Queen. In 1584 Raleigh sent Amadas and Barlow to find a place for a settlement. As the Queen refused to allow Raleigh to leave England, he fitted out an expedition consisting of seven ships, which sailed in 1585 under the escort of his cousin, Sir Richard Grenville, and planted a settlement on Roanoke Island, on the Carolina coast, with Ralph Lane (q.v.) as Governor. In June, 1586, however, the settlement was abandoned. Grenville left a new party of colonists, which was reënforced by settlers from England in the year following under John White, but ships sent out by Raleigh failed to reach the colony, and when, in 1590, a relief expedition finally arrived at Roanoke, all trace of the settlement had disappeared. Although the colony was a failure, the enterprise resulted in the introduction of the potato and of tobacco into England.

During 1587 and 1588, when Spanish invasion was threatened, Raleigh was one of a commission to draw up a plan for the defense of the country, and performed important services in levying and forming the militia in the west of England. It is not probable that he took any part in the actions against the Armada. Raleigh was not, as is frequently stated, with Drake in the Portugal expedition in 1589, but at that time was in Ireland, where his friendship with the poet Spenser was formed. In 1591 he was made second in command of an expedition under Lord Thomas Howard to intercept the Spanish plate fleet. Again the Queen refused to let him leave England and his place was taken by Sir Richard Grenville. In 1592 another expedition was equipped. Raleigh had obtained permission to command in person, but at the last moment was recalled and imprisoned in the Tower because of an intrigue with a maid of honor, Elizabeth Throgmorton, which had become known to the Queen. There he remained from July to September, when the expedition returned. Raleigh was permitted to marry, although forbidden to come to court. In 1593 he sat in Parliament as member for Cornwall. In 1594 he sent out an expedition in search of El Dorado (q.v.), which he conceived to be situated in the interior of South America, upon the Orinoco, in the country then designated as Guayana, or Guiana. The effort was unsuccessful, and Raleigh determined to go himself. He fitted out five ships, chiefly at his own expense, and obtained a commission from the Queen to wage war against the Spaniards. He penetrated into the interior, going up the Orinoco a distance of more than 400 miles, but was obliged to return for supplies. Upon reaching England he published his *Discoverie of Guiana* (1596). He brought back quartz containing gold, and the first mahogany seen in England. An expedition was sent against Cadiz in 1596, in which Raleigh distinguished himself by gallantry in action. In 1597 he was one of the commanders of a fleet sent to the Azores to intercept the Spanish treasure ships. Many valuable prizes were secured. The next few years were passed in administrative duties, as member of Parliament, and as Governor of Jersey.

For many years Raleigh had active and powerful enemies at court, and although even Essex, Howard, and Cecil could not permanently discredit him in the eyes of Queen Elizabeth, he met with nothing but ill treatment at the hands of James I. His posts and grants of monopoly were withdrawn, and a few months after the King's accession (1603) he was sent to the Tower on the charge of being privy to the plots contrived against the King's person by Lord Cobham and the Spanish agent, Count Aremberg. He was condemned under the harsh procedure of *læsa majestas* trials for failing to produce conspicuous proofs of innocence. A reprieve was granted and his personal property restored, but he still remained a prisoner in the Tower until his petition to be allowed to lead another expedition to the Orinoco was granted in 1616. The Spanish Ambassador protested, and Raleigh was ordered not to engage in any hostilities against the Spaniards on penalty of his life. He sailed on June 17, 1617, and encountered an unbroken series of misfortunes. During the voyage the Spanish settlement of San Tomás was attacked and destroyed. Upon his return to England he was at once arrested, and after some deliberation was executed, by virtue of the former sentence, on Oct. 29, 1618. During his long imprisonment in the Tower he wrote the *History of the World*, one of the monuments of Elizabethan literature. He also wrote treatises on religious and philosophical subjects and several poems of merit.

Bibliography. His collected works, including a life by Oldys and Birch, were published in London in 1829, and his correspondence is included in Edward Edwards, *Sir Walter Raleigh* (2 vols., ib., 1868). Consult also: E. W.

Gosse, *Raleigh*, in "English Worthies Series" (ib., 1886); Martin Hume, *Sir Walter Raleigh* (ib., 1897); William Stebbing, *Sir Walter Raleigh* (ib., 1899); I. A. Taylor, *Sir Walter Raleigh* (New York, 1903); Sir Sidney Lee, in *Great Englishmen of the Sixteenth Century* (ib., 1904); Hugh De Sélincourt, *Great Raleigh* (ib., 1908); F. A. Ober, *Sir Walter Raleigh* (ib., 1909); Beatrice Marshall, *Sir Walter Raleigh* (ib., 1914). His poems have appeared in several editions, a recent one edited by John Hannah (ib., 1892).

RALEIGH, SIR WALTER (?–). An English literary historian and critic, educated at University College, London, and at King's College, Cambridge. For a time he held the chair of modern literature at University College, Liverpool, and that of English literature at Glasgow University. Subsequently (1904) he was made professor of literature at Oxford, where he was fellow of Merton College in 1914. Raleigh was knighted in 1911. In 1915 he delivered the Vanuxem lectures at Princeton on "The Origins of Romance" and "The Beginnings of the Romantic Revival," and lectured on Chaucer at Brown, which gave him the degree of Litt.D. His principal writings are: *The English Novel* (1894), an excellent brief history of its subject; *Robert Louis Stevenson: An Essay* (1895); *Style* (1897); *Milton* (1900); *Wordsworth* (1903); *The English Voyagers* (1904); *Shakespeare* (1907); *Six Essays on Johnson* (1910).

RAL′LENTAN′DO (It., slackening). A musical term, abbreviated *rallent.* or *rall.*, indicating a gradual relaxing or diminution of time.

RALPH, JAMES (c.1695–1762). An American poet and pamphleteer, born in Philadelphia. He became an intimate friend of Benjamin Franklin, whom he accompanied to London in 1725. There he tried to support himself by writing, but with little success. Pope satirized his poem *Night* (1728) in the *Dunciad*. Afterward Ralph attached himself to the Prince of Wales and used his pen to assist his friends the Whigs in every possible way. When George III ascended the throne he was given a pension. His works include: *Zeuma* (1729), a poem; *The Groans of Germany* (1734), a political pamphlet; *The Use and Abuse of Parliaments* (1744); *History of England during the Reigns of King William, Queen Anne, and George I* (1744); poems, essays, and plays.

RALPH, JULIAN (1853–1903). An American author and journalist, born in New York City. He joined the staff of the New York *Daily Graphic* in 1875, but within a year he left it and was on the staff of the New York *Sun* until 1895, gaining a world-wide reputation as a correspondent. In 1896 he became London correspondent for the New York *Journal*, was with the Turkish armies during the Græco-Turkish War in 1897, and in 1899 went to South Africa as war correspondent for the London *Daily Mail*. Besides numerous magazine articles his publications include: *Cuba* (1882); *The Sun's German Barber* (1883); *Dutchman or German* (1889); *Along the Bowstring* (1891); *On Canada's Frontier* (1892); *Chicago and the World's Fair* (1893); *Our Great West* (1893); *People we Pass* (1896); *Dixie* (1896); *Alone in China* (1897); *A Prince in Georgia* (1899); *Towards Pretoria* (1900); *An American with Lord Roberts* (1901); *War's Brighter Side* (1901); *The Millionairess* (1902), a novel; *The Making of a Journalist* (1903).

RALPH ROISTER DOISTER. A comedy by Nicholas Udall (q.v.).

RAM (AS. *ram*, *ramm*, Ger. *Ramme*, battering ram, OHG. *ram*, *rammo*, Ger. *Ramm*, male sheep), MARINE. It was evident to the ancients that a ship, if given a sufficient rate of speed, could deal the enemy's vessel a more disastrous blow than could any weapon then known, so that the use of the ram is as ancient as maritime war. The oar-propelled galley furnished requisite speed and control for ramming, and to further the efficacy of craft of this sort they were furnished with beaks. The short ranges at which ancient weapons were dangerous were favorable to the use of the ram, and most of the celebrated actions of the galley period were decided by it. But the advent of gunpowder rapidly effected a change. With the introduction of sail propulsion ramming was nearly given over, but when steam came to the front it reappeared in a form which soon reached its highest development. The ram, however, has never accomplished much except under special conditions. W. Laird Clowes, in 1894, tabulated all cases of ramming or attempted ramming which had taken place in modern naval warfare up to that time and he found that: (*a*) when both vessels have had plenty of sea room and were able to steer, not one of the 32 attempts to ram were wholly successful—indeed, the ships attempting to ram received slightly the graver injuries; (*b*) where the ramming took place in waters which were too contracted to admit of free manœuvring, 28 per cent of the vessels attacked by ramming were sunk, as were 3 per cent of the attacking ships, while the percentages of the attacked vessels which were seriously injured was double that of the ships attempting to ram. The torpedo and the enhanced gun power of recently built ships both serve to weaken the influence of the ram upon naval operations, leaving its probable effective use confined to unusual and special conditions. One of these is the attack of submarine boats. During the Great European War many submarines were known to have been destroyed, some of which were sunk by ramming.

It is difficult to determine who first suggested ramming by steam vessels. One of the earliest designs is that of Capt. Samuel Barron of the United States navy, which was made in 1827 and a model of which is preserved at the Naval Academy, Annapolis. At this time, however, there was but one steam man-of-war in existence, and it was not until the Civil War broke out that attention was seriously attracted to the importance of ramming. The *Merrimac* was fitted with a ram with which she sank the *Cumberland*, and the *Monitor* was designed to use her sharp bow for ramming if opportunity offered. After the sinking of the *Cumberland* many war vessels were supplied with rams, and ramming became a favorite method of attack during the latter part of the Civil War. The battle of Lissa (1866) was won by a determined use of the ram, but the success attained was partly due to accident and partly to the bad handling of the Italian ships. Since the perfection of the automobile torpedo and the development of the submerged torpedo tube, most naval officers have regarded ram attack as a last, desperate resort; and the teachings of the Russo-Japanese War (q.v.) are so particularly unfavorable to the employment of the ram that in the design of nearly all the latest ships it has been omitted, though the ram-shaped bow is still preserved in recent American battleships, and the size and amount of the projection beyond the stem is increased, because this form gives the least wave-making resistance.

The marine ram as a special vessel designed to use its beak as its principal weapon of offense appears to have had few advocates after the time of Captain Barron's ram in 1827 until (as already mentioned) late in the Civil War. Admiral Ammen of the United States navy was a strong advocate of the purely ram type of vessel, and one of his designs was embodied in the U.S.S. *Katahdin.* About 1880 the British built the torpedo ram *Polyphemus,* which was like the *Katahdin* in many respects. No other large ram vessels have been built which were not also well armed with guns.

Bibliography. *Journal of the Royal United Service Institution,* particularly 1875, but also various later volumes (London); Elliot, *The Ram* (ib., 1884); Noel, *The Gun, Ram, and Torpedo* (Portsmouth, England, 1888); W. L. Clowes, "The Ram in Action and Accident," in *Proceedings of the United States Naval Institute,* No. 69 (Annapolis, 1894); Bennitt, *The Monitor and the Navy under Steam* (Boston, 1900); also *Proceedings of the United States Naval Institute* (Annapolis, bi-monthly).

RAMA, rä′mȧ, or **MELCHORA,** mĕl-chō′rȧ. An interesting tribe formerly upon the Rama River on the Caribbean coast of southern Nicaragua and now gathered upon a small island in Bluefield lagoon. They are related linguistically to the wilder Guatuso of northern Costa Rica. They are now on the verge of extinction, having numbered only about 250 persons in 1891, all Christianized by Moravian missionaries and described as being of fine physique and great strength.

RAMADAN, rä′mȧ-dän′ (Ar. *Ramaḍān,* from *ramida,* to be burning hot). The ninth month in the Mohammedan year. Mohammed is said to have had his first revelation in Ramadan, and every Moslem is therefore enjoined to keep a strict fast during this month from dawn to sunset of every day and to abstain from eating, drinking, smoking, bathing, smelling perfumes, and other bodily enjoyments. During the night, however, the most necessary wants may be satisfied, and this permission leads to nightly indulgences in all sorts of enjoyments. As the Mohammedan year is a lunar one, the months rotate through the different seasons, and the fast of Ramadan becomes a severe affliction upon the faithful when the month happens to fall in the hot days of the summer. The sick, travelers, and soldiers in time of war are temporarily released from this duty, though it must subsequently be performed during an equal number of days. Nursing and pregnant women and those to whom it might prove really injurious are exempted from fasting. During this month 20 additional prayers are said after the night prayer. Very pious believers seclude themselves and devote their time to the reading of the Koran. The fast is followed by the feast of Beiram (q.v.). In establishing this fast Mohammed seems to have been guided by the Christian institution of Lent, which in the early Church varied in length from four to six weeks. The principal passages treating of the fast of Ramadan are found in the Koran, sura ii, 179–184. Consult: D'Herbelot, *Bibliothèque orientale* (Paris, 1781); Julius Wellhausen, *Reste arabischen Heidentums* (2d ed., Berlin, 1897); C. I. Huart, *Histoire des Arabes,* vol. i (Paris, 1912).

RAMAKA, rȧ-mä′kȧ. See Hatasu.

RAMAKRISHNA, rä′mȧ-krĭsh′nȧ (1833–86). A Hindu yogi or ascetic. He was born at Kamarpukar, near Jahanabad, in Bengal, and was the youngest son of a poor Brahmanic family. At 16 years of age he attended the school of his eldest brother, Ramkumar Chattopadhyaya, at Calcutta, and followed him when he was appointed priest to the temple of the goddess Kali, founded in 1853 at Dakshinesvara. He became a devotee of Kali and began a course of 12 years of asceticism. The fame of his humility and wonderful teachings spread, and people of all classes, including Keshub Chunder Sen, fell under his spell. Consult Max Müller, *Ramakrishna: His Life and Sayings* (New York, 1899), and Abhedānanda, *The Sayings of Sri Ramakrishna* (ib., 1903).

RAMALEY, răm′ȧ-lĭ, Francis (1870–). An American botanist and hygienist. He was born at St. Paul, Minn., and was educated at the university of that State (S.B., 1895; Ph.D., 1899), where he was an instructor in botany in 1894–98. He served as assistant professor of biology in 1898–99, and thereafter as professor, at the University of Colorado. In 1909 he became director of the Mountain Laboratory at Tolland, Colo., and in 1911–12 was president of the board of education of Boulder. Ramaley is author of *Wild Flowers and Trees of Colorado* (1909) and *Prevention and Control of Disease* (1913).

RAMAYANA, rȧ-mä′yȧ-nȧ (Skt., *Rāmāyaṇa,* story of Rama). The second of the two great epic poems of mediæval India. It is in the main the work of a single author, Valmiki. Herein lies the important distinction between it and the *Mahabharata* (q.v.). Though all its parts are not from the same hand, and though it is not entirely free from digressions or episodes, the poem tells a connected story of great interest in epic diction of the highest order; it ranks with the great epics of the world, and is even to this day the favorite poem of the Hindus.

The central figures in the epic are Rama and his devoted wife, Sita; the main event, the conquest of Lanka (probably Ceylon).

The *Ramayana* consists of seven books in about 24,000 verses or slokas. Notwithstanding the essential unity of the entire epic, the first and last books are in a certain sense secondary. The first deals with Rama's youth up to his marriage with Sita; the last with Rama's life from his restoration to his death. In these Rama is apotheosized and identified with the god Vishnu (q.v.) as one of his incarnations. The main body of the epic (books ii–vi) deals with Rama as a national hero, the embodiment especially of the ethical ideals of the people. But the Rama-Sita story itself, notwithstanding that it presents itself outwardly as an heroic legend, is justly under the suspicion of containing one or more mythic roots, though the exact formulation and explanation of them are perplexing. In the Veda Sita (q.v.) is the personified furrow of the plowed field, the beautiful wife of Indra or Parjanya. Hence Rama has been identified with Indra (q.v.), the slayer of demons, especially of the demon Vritra. In the epos Ravana is supposed to have taken the place of Vritra. According to another interpretation the legend is a mixture of culture and nature myth, typifying the spread southward towards Ceylon of Brahmanical civilization. The demons who disturb the ascetics in their holy practices are the barbarous tribes who oppose Aryan culture. In any case these mythical and other motives cannot have served as more than mere suggestions for the story.

The *Ramayana* exists in three recensions which differ from one another in their reading, in the order of their verses, and in having each more or less lengthy passages that are wanting in the others. The best known and most popular of these is also the most original version of the poem. Its home is in the northwest and south of India. It has been edited a number of times in India, and is most accessible in the second Bombay edition of 1888. It has been edited by the Italian scholar Gaspare Gorressio, who added to his edition a somewhat free Italian translation in poetical prose (10 vols., Paris, 1843–67). The second recension arose in Bengal. The third recension, apparently originating in the west of India, is as yet unpublished, but is accessible in manuscripts at Berlin and Bonn. The poetic translation of the Anglo-Indian scholar Griffith in five volumes (Benares, 1895; into Eng. prose by M. N. Dutt, 3 vols., Calcutta, 1894) is based upon the second recension.

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RAMBAUD, räɴ'bō', Alfred Nicolas (1842–1905). A French historian, born at Besançon. He was a pupil of the Ecole Normale, and after receiving his degree in 1870 traveled in Russia and taught history at Caen and Nancy (1871–79). He was chief of a department in the Ministry of Public Instruction in Ferry's cabinet in 1879–81 and held the portfolio of Public Instruction in the Méline cabinet in 1896–98. He became professor of contemporary history at the Sorbonne in 1883 and was elected to the Academy of Moral Sciences in 1897. His works include: *La Russie épique* (1876); *Histoire de la Russie* (1878), translated by Lang as *A History of Russia* (1879); *Histoire de la civilisation française* (1887); *Histoire de la civilisation contemporaine en France* and *Histoire de la révolution française, 1789–99* (1895); *Expansion of Russia: Problems of the East and Problems of the Far East* (1904). With Lavisse he directed the publication of the *Histoire générale du IVme siècle à nos jours* (1893–1901).

RAMBAUT, răm'bō, Arthur Alcock (1859–). An English astronomer, born at Waterford and educated at Trinity College, Dublin, where he was assistant in astronomy from 1882 to 1892. He was then Andrews professor of astronomy at the University of Dublin and royal astronomer of Ireland until 1897, when he was appointed Radcliffe observer at Oxford. His valuable astronomical papers are to be found in *Transactions* and *Proceedings* of the Royal Dublin Society, of the Royal Irish Academy, and of the Royal Astronomical Society, and in the publications of Radcliffe Observatory.

RAMBERG, räm'běrk, Arthur, Baron (1819–75). A German genre painter and illustrator, born in Vienna. He studied at the School of Art in Prague under Franz Kadlik and others, then in Dresden (1844) under Julius Hübner, and was influenced by Schwind. His great coloristic talent is most successfully displayed in "Women of Dachau on Sunday" (1853); "Morning Devotion in the Mountains" (1855); "Hide and Seek," "After the Masked Ball" (1858); "Meeting on the Lake" (Metropolitan Museum, New York); and "Invitation to Boating." In 1860 Ramberg was appointed professor at the School of Art in Weimar, where he executed the historical painting "Court of Emperor Frederick II at Palermo" (1866, Maximilianeum, Munich) and where he also painted the "Fairy Tale of the Frog King" (Weimar Museum). He earned fame as an illustrator, notably with the drawings for Cotta's jubilee edition of Schiller's poems and with the cycles of grisailles to Goethe's *Hermann und Dorothea* and to Voss's *Luise*. In 1866 Ramberg became professor at the Munich Academy. Consult Rosenberg, *Geschichte der modernen Kunst*, vol. iii (Leipzig, 1889), and Richard Muther, *History of Modern Painting* (New York, 1907).

RAMBLER, The. A periodical published twice a week from 1750 to 1752 by Dr. Samuel Johnson, who wrote all the numbers but five.

RAMBOUILLET, räɴ'bōō'yȧ', Hôtel de. The house which, towards the middle of the seventeenth century, was the most famous meeting place of the cultivated society of Paris. The house itself had previously been known as the Hotel Pisini, the residence of the Marquis of that name, whose daughter, Catherine de Vivonne, received it as a part of her dowry on her marriage in 1600 with the future Marquis de Rambouillet. Dissatisfied with the style of the house, she had it entirely remodeled between 1610 and 1617. After its completion the young beauty, weary of the crowded assemblies of the Louvre, decided to remain at home and make her own house supply all the society she desired. Here, for a generation, assembled the most brilliant coterie in Paris, known, from their insistence on refinement in speech and manners, as *précieux*. Among early frequenters were Richelieu, Malherbe, Balzac, Corneille, Racan, Voiture, and, somewhat later, Bossuet, Ménage, Chapelain, Scarron, Saint-Evremond, Benserade, and La Rochefoucauld. There too were trained the ladies who were to found literary salons in their turn—Madame de la Fayette, Madeleine de Scudéry, the Duchess of Longueville, and Madame de Sévigné. Its influence was altogether refining, but it led in some to an exaggeration which resulted in a most ludicrous affectation. It must be borne in mind that Molière, in his *Précieuses ridicules*, was satirizing not this accomplished group, but the exaggerations of their pedantic imitators. From a little before 1620 the society which assembled here represented all that was best and brightest in the social life of the time. Its lustre began to decline after the marriage (in 1645) of the daughter of the house to the Duc de Montausier, and the troubles of the Fronde, the death of M. de Rambouillet in 1652, and his wife's increasing age and infirmities put an end to it.

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RAMBOUILLET, Marquise de. See Rambouillet, Hôtel de.

RAMBOV, rȧm-bō̇f′. A town in Russia. See Oranienbaum.

RAMEAU, rȧ′mō̇′, Jean (1858–). A French poet and novelist, whose real name was Laurent Lebaïgt. He was born at Gaas (Landes). He began with a volume of fantastic verse, *Poèmes fantasques* (1883), which was followed by *La vie et la mort* (1886), *La chanson des étoiles* (1888), *Les féeries* (1897), etc. Of his 40 novels the following are probably the best known: *L'Amant honoraire* (1895); *Ame fleurie* (1896); *La vierge dorée* (1901); *La route bleue* (1912); *Le fuseau d'or* (1914).

RAMEAU, Jean Philippe (1683–1764). A French composer and organist, who is to be credited with the foundation of the modern science of harmony. He was born of a musical family at Dijon. He studied the organ under Marchand in Paris and became organist at Lille and at Clermont. His theories of the relationship of sounds he published in 1722 under the title of *Traité de l'harmonie,* and in 1726 he published *Nouveau système de musique théorique.* The main points of his new harmonic theory were the reduction of all possible chords to a limited number of fundamental chords resting upon an imaginary fundamental bass, which was not the same as thorough or general bass, but a series of root tones which underlie the various chord progressions. These theories received the formal approval of the Academy in 1737, and had much to do with the development of the theory of music. Rameau's dramatic composition *Samson,* with a libretto by Voltaire, was rejected at the Opéra on account of its biblical subject. His second attempt, *Hippolyte et Aricie,* obtained a hearing in 1733, but was not immediately successful, and he was tempted to abandon dramatic composition. His next effort, the opera ballet *Les Indes galantes* (1735), won public favor. *Castor et Pollux* (1737) is usually considered his best work. Other operas followed in quick succession and held the French stage for a generation, besides winning for him from Louis XV the position of court composer, especially created for him. His other compositions include: *Les talents lyriques* (1739); *Dardanus* (1739); *La princesse de Navarre* (1745); *Zaïs* (1748); *Pygmalion* (1748); *Platée* (1749); *Daphné et Eglé* (1753); *Zéphire* (1757); *Les surprises de l'amour* (1759); *Les Paladins* (1760). He wrote several books of compositions for the clavier which are of the greatest importance in the history of piano music. As developments of his operatic works for the stage he produced *Génération harmonique* (1737) and *Démonstration du principe de l'harmonie.* His services to music were acknowledged by the erection of a statue to him in his native town in 1880. Under the editorship of Saint-Saëns and Malherbe a complete edition of Rameau's works was in course of publication (1915) by Durand et Fils in Paris. Consult: A. Pougin, *Rameau: sa vie et ses œuvres* (Paris, 1876); L. Laloy, *Rameau* (ib., 1908); L. de la Laurencie, *Rameau* (ib., 1908); Ch. Malherbe, *Biographie* (in vol. i of the complete works).

RAMÉE, rȧ-mā′, Louise de la (generally known by her pen name, Ouida) (1839–1908). An English novelist, whose father was French and whose mother English. She expanded her surname Ramé into de la Ramée, and her pseudonym Ouida was her own childish pronunciation of Louisa. Born at Bury St. Edmunds, Jan. 1, 1839, she moved to London in 1859 and in that year made her literary début in Harrison Ainsworth's *New Monthly Magazine* with a short story entitled "Dashwood's Drag." Her first novel, *Held in Bondage* (1863), first appeared in the same magazine. A parody in *Punch* of her novel *Strathmore,* that followed in 1865, together with Lord Strangford's denunciation of her novels in the *Pall Mall Gazette,* assisted greatly in establishing her vogue. Ouida was a born story-teller, picturesque and at times strikingly dramatic. Her romances are often false in their interpretation of the significance of conduct, and in sentiment they are sham and tawdry. Ouida herself had little more than a bowing acquaintance with the glittering military and fashionable life she delighted to depict. The Italian peasant, however, she knew at first hand and presented with faithfulness and sympathy. She loved dogs, and in certain of her stories has presented memorable pictures of them. After 1860 Ouida lived much in Italy, settling there permanently in 1874. Unable to handle money with care, and after 1890 steadily less popular, Ouida died in poverty at Viareggio, Jan. 25, 1908. In later life she wrote considerably for the magazines and reviews on English, French, and Italian literature. An ardent antisuffragist and antivivisectionist, she put her convictions on these subjects into *Views and Opinions* (1895) and *Critical Studies* (1900). Many of Ouida's novels had an immense vogue in English, and several of them also in French, Italian, and Hungarian. The most popular, in addition to those already named, were: *Idalia* (1867); *Under Two Flags* (1867); *Tricotrin* (1869); *Puck* (1870); *A Dog of Flanders, and Other Stories* (1872); *Two Little Wooden Shoes* (1874); *Moths* (1880); *Bimbi* (1882), children's stories, one of which, *The Nürnberg Stove,* is a classic of its kind and is to be had separately. Consult: Edmund Yates, *Celebrities at Home* (1st series, London, 1877); S. M. Ellis, *W. H. Ainsworth and his Friends* (ib., 1911); Elizabeth Lee, *Ouida* (New York, 1914).

RAMÉE, Pierre de la. See Ramus, Petrus.

RAMENGHI, rȧ-mĕn′gē̇. See Bagnacavallo.

RAM′ESES, or **RAM′SES** (Gk. Ῥαμέσσης, *Rhamessēs,* Ῥάμσης, *Rhamsēs,* Ῥάμψης, *Rhampsēs*). The name of 12 kings of Egypt of dynasties XIX and XX.

Rameses I, the first King of dynasty XIX, ruled for a brief period about 1355 B.C. Beyond the fact that he waged war in Nubia, where he left an inscription, and constructed some of the buildings at Karnak, little is known of his reign. His mummy was found, in 1881, at Deir el Bahri. His son, Seti I (q.v.), built the Memnonium at Kurnah (q.v.) in honor of his father's memory.

Rameses II (c.1340–1273 B.C.), the son of

Seti I and the grandson of Rameses I, figures in history as the *grand monarque* of Egypt. The earlier portion of his reign was spent in war with the Cheta or Hittites, who occupied the former Asiatic possessions of Egypt as far south as the northern border of Palestine. In his second year he reconquered Phœnicia as far as Berytus, and left a memorial inscription on the banks of the Nahr el Kelb. In his sixth year he moved against the important city of Kadesh on the Orontes, but, though he was successful in an engagement with the enemy's chariot force, no decisive result was obtained and the city did not surrender. In the fighting around Kadesh Rameses with a detachment of his troops was cut off from the main body and was for a time in personal danger. His exploits on this occasion form the theme of the so-called poem of Pentaur (q.v.), in which they are celebrated with gross exaggeration. The war continued with varying success for a number of years, but finally a peace was arranged by the terms of which Egypt retained Phœnicia as far as Byblus and a strip of territory to the north of Palestine. In his twenty-first year Rameses concluded an offensive and defensive alliance with the King of the Hittites and cemented it by marrying his daughter. Of the treaty two copies have been discovered on the temple walls at Thebes, and a Hittite copy was discovered in 1906 in Babylonia cuneiform on a tablet found at Boghaz-kieui. The remainder of Rameses's long reign was peaceful and is chiefly remarkable for the large number of important edifices constructed by the King, who, as a builder, surpassed all other Pharaohs. By his many wives and concubines he had many children, 162 being mentioned by name on the monuments. He died after a reign of 67 years and his mummy, at first buried at Bîbân el Mulûk, was subsequently concealed from grave robbers in the shaft at Deir el Bahri, where it was found in 1881. Rameses II was formerly regarded as the Pharaoh of the oppression, and his son, Mer-en-Ptah, as the Pharaoh of the Exodus; see, however, the section on ancient history under EGYPT. See Plate with EGYPTIAN ART.

RAMESES III, son of Setuakht, the second Pharaoh of dynasty XX, reigned for 33 years from about 1230 B.C. or perhaps a little later. In the fifth year of his reign he expelled the Libyans, who had taken advantage of the weakness of Egypt at the end of dynasty XIX to establish themselves in the western part of the delta. In the eighth year of his reign he attacked and made tributary the piratical Pulastæ or Philistines and other "peoples of the sea," who had recently effected a settlement in Palestine and were making incursions into the delta. Three years later he repelled a Libyan invasion, and in his twelfth year he raided the Amorite district north of Palestine. From this campaign he brought back rich booty which he lavished upon the temples of Egypt and especially upon the national sanctuary of Ammon of Thebes. He made, however, no permanent conquests in Asia, and Egyptian influence in that quarter soon sank to a very low ebb.

Rameses III, like Rameses II, was a great builder. The great temple of Medinet Habu (q.v.) is his work, and he restored, or made additions to, temples in many parts of Egypt. The King's mummy was among those found at Deir el Bahri in 1881. He was followed by nine kings of little importance, all bearing the name of Rameses (RAMESES IV–XII), whose reigns mark a steady decline in the affairs of Egypt. Through the enormous wealth lavished upon the temples by many successive Pharaohs, the ecclesiastical interest had by this time attained a preponderating influence in the state, and the feeble successors of Rameses III were mere puppets in the hands of the powerful priesthood of Ammon. Finally, about 1100 B.C. Her Hor (q.v.), the high priest of Ammon of Thebes, dethroned Rameses XII and made himself King in name as well as in fact.

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RAM'ESSE'UM (Neo-Lat., from *Rameses*). A temple built by Rameses II on the west bank of the Nile at Thebes and dedicated to the god Ammon. The temple is now in a ruined condition. The entrance is formed by a great pylon of which the inner face is well preserved and is covered with sculptures representing scenes from Rameses's Syrian campaigns. Near the entrance to the inner court lie the broken fragments of a colossal statue of Rameses II. Consult: K. R. Lepsius, *Denkmäler aus Aegypten und Aethiopen* (Berlin, 1850–59); A. F. F. Mariette, *Monuments of Upper Egypt* (London, 1877); Johannes Dümichen, *Geschichte des alten Aegyptens* (Berlin, 1878); Quibell, *The Ramesseum* (London, 1898); W. M. Flinders Petrie, *A History of Egypt* (New York, 1905).

RAMESWARAM, rä-mĕs'wŭ-rŭm', **RAMISSERAM**, or PAMBAM. A small island in the Gulf of Manar, forming the west end of the line of black rocks stretching from the Indian peninsula to Ceylon and known as Adam's Bridge. It is low and sandy and covers an area of 53 square miles. At the town of the same name the temple, with a magnificent gopura 105 feet high, is believed to have been founded by Rama and has been visited for centuries by pilgrims from all over India. The chief town is Pambam, at the west end. Pop. (island), 1911, 23,605, chiefly Brahmins.

RA'MIE (Malay name), *Bœhmeria nivea;* sometimes called in trade CHINA GRASS. A nettle-like but nonstinging East Indian shrub of the family Urticaceæ. The upright stems

RAMIE.

produced by the perennial rootstock furnish one of the most durable of vegetable fibres. It is stronger than hemp and almost equals silk in fineness and lustre. The fibre is highly valued for making cordage, nets, various fabrics, and paper which is especially esteemed for banknote making. The plant requires a hot, moist, equable climate and a rich damp soil. It is propagated by seeds, cuttings, layers, and division. When the leaves can be readily stripped off the stems are harvested and the fibres removed by machinery or, either before or after boiling in chemicals, by hand—either process being costly or otherwise unsatisfactory. The crop can be raised in the southern United States, but the cost of obtaining the fibre is against the establishment of the industry and foreign fields are relied upon to supply American needs. Rhea, *Bœhmeria tenacissima*, is a very similar fibre plant. Consult: S. H. Slaught, *Promotion of Ramie Industry* (Washington, 1908); H. A. Carter, *Ramie (Rhea) China Grass: The New Textile Fibre* (New York, 1910). See Bœhmeria; and Colored Plate of Fibre Plants, accompanying article Hemp.

RAMILLIES, rȧ′mē̇′yē̇′. A village of Brabant, Belgium, 13 miles north of Namur and 28 miles southeast of Brussels (Map: Belgium, C 4). It is memorable as the place near which, on May 23, 1706, one of the most important battles of the War of the Spanish Succession was fought. The French forces were under the command of Marshal Villeroi and the Elector of Bavaria, while Marlborough led the troops of the allies. Villeroi, after a battle of three hours and a half, was defeated, with the loss of almost all his cannon, the whole of his baggage, and 13,000 men in killed and wounded, the loss of the allies being only about 3500.

RAMISSERAM. See Rameswaram.

RAMLER, räm′lẽr, Karl Wilhelm (1725–98). A German poet, of the rationalistic school, born at Kolberg. He studied theology at the University of Halle and afterward devoted himself to literature. In 1748 he was made professor at the Military Academy of Berlin, where he lectured on logic and literature. He was considered a master of poetical diction. King Frederick William II nominated him member of the Berlin Academy of Sciences, granted him a pension of 800 thaler per annum, and appointed him assistant director of the National Theatre in 1790, the sole director of which he was from 1793 to 1796. His fame as a lyric poet Ramler established by his edition of *Lieder der Deutschen* (1766), which he remodeled to a certain extent and afterward increased and reedited as *Lyrische Blumenlese* (1774–78). He wrote the cantata *Der Tod Jesu*, made famous by Graun's music. Together with Lessing he published a selection of Logau's epigrams (1759). He was a rigid adherent to the so-called classical models, and was called the German Horace because of his imitations of that poet. By his correct translations and elegant style Ramler exerted great influence on the development and refinement of the German language, and he is regarded as the creator of the art of translating into German. His other writings include *Sammlung der besten Sinngedichte der deutschen Poeten* (1766) and *Kurzgefasste Mythologie* (1790). His poetical works were edited with biographical notes by Göckingk (Berlin, 1800–01); selected poems with excellent biographical introduction by Muncker in Joseph Kürschner, *Deutsche National-Litteratur*, vol. xlv (Stuttgart, 1894). Consult Schüddekopf, *Ramler bis zu seiner Verbindung mit Lessing* (Leipzig, 1886), and the *Allgemeine deutsche Biographie*, vol. xxvii (ib., 1888).

RAMMAN, räm′mȧn. An epithet of the Ammonitish and Aramæan deity Adad or Hadad (q.v.). Ramman means the roarer. The name occurs occasionally in Akkadian texts. A Chaldæan inscription published by Belck-Lehmann in 1899 has shown that the Assyrians pronounced the divine name as Adad, and not Ramman, in Adadnirari. But it is found several times in the Old Testament under the form *Rimmon*. According to 2 Kings v. 18 he was the chief deity of Damascus; the name also appears in the proper name Tabrimmon (1 Kings xv. 18), and probably in several Palestinian place names. He probably came through the Amorites to the Akkadians, the Lulubæans, the Assyrians, and probably also to the Sumerians, among whom his name seems to have been Ishkur. As the storm god Adad-Ramman is the deity presiding over the rainy season and floods, is the genius of the battle onslaught, and is even a god of oracles. He carries the thunderbolts and the battle-axe and is symbolized by the bull. In the Syrian sphere Adad appears under various names, Hadad, Addu, Daddu, the name being preserved in the biblical names Hadad and Ben Hadad and in Bar Hadad of the Zakir inscription. Hadad is likewise a storm god and was the chief in the Syrian pantheon, his cult extending from Sengirli and Aleppo to the south of Damascus. He was identified by the Hittites and Mitannians with Teshub. In Zech. xii. 11 there is a reference to the wailing for Hadad Rimmon, who probably was identified with Tammuz (q.v.).

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RAMMELSBERG, räm′mĕls-bĕrᴋ, Karl Friedrich (1813–99). A German chemist and mineralogist, born in Berlin. He studied in the University of Berlin, became a professor there in 1845, and taught also in the Royal Industrial Institute and the Academy of Mines. He resigned in 1891. His specialty was mineralogical chemistry and he also made a number of valuable contributions to chemical analysis. His chief works include: *Handwörterbuch des chemischen Teils der Mineralogie* (1841–53); *Lehrbuch der Stöchiometrie* (1842); *Lehrbuch der chemischen Metallurgie* (1850; 2d ed., 1865); *Handbuch der kristallographischen Chemie* (1855–57); *Elemente der Kristallographie* (1883); *Chemische Abhandlungen* (1888).

RAMMOHUN ROY, rȧ-mō′hōōn roi (1772–1833). A Hindu rajah, scholar, and theist, the founder of the Brahmo-Somaj (q.v.). He was born at Bardwan, Bengal, of a high-caste Brahman family. He received a good native education, acquired some knowledge of Persian, and at Patna and Benares studied Sanskrit works on Hindu law, literature, and religion. In a treatise antagonistic to Hindu idolatry, written when he was 18 years of age, he laid the foundation of a prose literature in the Bengali vernacular. His religious views aroused the antagonism of his family, and in his two or three years' residence in Tibet he also gave offense by his denial that the Lama was the creator and preserver of the world. For five years he held the office of revenue collector in the District of Rangpur. He published various works in Persian, Arabic, and Sanskrit, their object being the uprooting of idolatry, and he was instrumental in procuring the abolition of suttee (q.v.). Becoming convinced of the excellence of the moral theories of Christianity, he published *The Precepts of Jesus, the Guide to Peace and Happiness* (1820), a work of Unitarian tendencies. In 1830 was opened the first building in the Brahmo-Somaj, or Theistic church of India, which he had inaugurated and endowed. Shortly afterward (1831), as representative of the titular King of Delhi, who had created him a rajah, he visited England. He was deluged with invitations, and in his anxiety to see everything overtaxed his strength and died at Bristol, where he is buried. Consult Carpenter, *The Last Days of Raja Rammohun Roy in England, with Biographical Sketch* (London, 1866).

RAMNES, răm′nēz, or **RAMNENSES**, răm-nĕn′sēz. One of the three patrician tribes—Ramnes, Tities, and Luceres—which in the oldest times constituted the *populus Romanus.*

RAMÓN Y CAJAL, rȧ-mōn′ ē kȧ-hȧl′, SANTIAGO (1852–). A Spanish histologist. He was born at Petilla, Aragon, and received his medical education at the University at Saragossa, graduating in 1873. In 1881 he became professor of anatomy at the University at Valencia, in 1886 professor of histology at Barcelona, and in 1892 professor of histology at Madrid. In 1906 he received one-half the Nobel prize for medicine for his work on the histology of the brain and nerves, Golgi (q.v.) being the other recipient. Ramón y Cajal also found a new staining method for histological researches of the nervous system. Among his writings are: *Manual de histología normal y técnica micrográfica* (1889; 4th ed., 1905); *Les nouvelles idées sur la structure du système nerveux chez l'homme et chez les vertébrés* (1894); *Elementos de histología normal* (1895); *Manual de anatomía patológiea general* (1896); *Textura del sistema nervioso de hombre y de los vertebrados* (2 vols., 1899–1905); *El aparato endocelular de Golgi de la célula de Schwann* (1912).

RAMOTH-GILEAD, rā′mŏth-gĭl′ĕ-ăd. A chief city of Gad, east of the Jordan (Map: Palestine, D 3). It is called Ramoth in Gilead and in 2 Kings viii. 29 Ramah; the Gilead of Hos. vi. 8 and Judg. x. 17 may mean the same. It is mentioned as a city of refuge and a Levitical city (Deut. iv. 43; Josh. xx. 8, xxi. 38) and as the headquarters of one of Solomon's commissarial officers (1 Kings iv. 13). It was a strong fortress and the key to an important district. Ahab, King of Israel, was killed there in the wars with the Syrians (1 Kings xxii), and his son Joram was wounded there some years later (2 Kings viii. 28). Reimun in the hills of Gilead, Es-Salt, and Jerash have been suggested as possible identifications of Ramoth-Gilead; the weight of the evidence seems to be in favor of the last named. Consult Selah Merrill, *East of the Jordan* (New York, 1881), and G. A. Smith, *Historical Geography of the Holy Land* (New York, 1904).

RAM′PANT (Fr., raging). In heraldry (q.v.), a term applied to a lion or other beast of prey when erect on its two hind legs, with only one of the forelegs elevated, the head being seen in profile. Sometimes also termed counter-rampant.

RAMPART. See FORTIFICATION.

RAMPOLLA, rȧm-pŏl′lȧ, MARIANO, MARQUIS DEL TINDARO, CARDINAL (1843–1913). An Italian prelate, born Aug. 17, 1843, at Polizzi, Sicily. He was educated at the Collegio Capranica, the Jesuit College, and the Accademia dei Nobili Ecclesiastici, all in Rome. Afterward he entered the service of Pope Pius IX and in 1875 was appointed councilor to the papal nunciature at Madrid. But it was with the long incumbency of Leo XIII that he was mainly identified. Upon his return to Rome he became Secretary of the Propaganda for Eastern Affairs and in 1880 Secretary of Ecclesiastical Affairs. In 1882 Rampolla was made Papal Nuncio at Madrid, and it was he who suggested the Pope as arbitrator between Spain and Germany in the dispute over the Caroline Islands in 1885. Created titular Archbishop of Heracles in 1882, five years later he was made Cardinal and appointed Papal Secretary of State. This difficult position brought him into contact with the Italian government (especially during Crispi's premiership) in the matter of penal laws directed against the clergy. In endeavoring to strengthen French sympathies for the holy see Rampolla antagonized Germany and Austria. This is said to have been the cause of Austria's veto when upon the death of Leo XIII (1903) Rampolla led in the balloting for his successor. After the election of Cardinal Sarto (Pius X) Rampolla resigned as Secretary of State and lived in retirement near the Vatican, devoting himself to the study of archæology and sacred literature, until his death, Dec. 16, 1913. He had been a strong defender of the temporal power of the Pope against the restrictive measures of the Italian government. Benedict XV, successor of Pius X, early saw service as an assistant to Rampolla, and it was expected that as Pope he would revive the policy of active participation in the diplomatic affairs of Europe, persistently followed by Leo XIII and his Secretary of State.

RAMPUR, rȧm-po͞or′. A native state, feudatory to the United Provinces of Agra and Oudh (q.v.), British India, having an area of 899 square miles. Pop., 1901, 533,212; 1911, 531,217.

RAMPUR. The capital of the native state of the same name, British India, on the Kosila River, 38 miles northwest of Bareli, with which it is connected by rail (Map: India, D 3). Manufactures of pottery and damask are important industries. Pop., with cantonment, 1901, 78,758; 1911, 74,316.

RAMSAY, răm′zĭ, ALLAN (1686–1758). A Scottish poet, born at Leadhills in the Parish of Crawford, Lanarkshire, Oct. 15, 1686. His father was manager of Lord Hopetoun's mines at Leadhills, and his mother, Alice Bower, was the daughter of a Derbyshire instructor of miners. He received the ordinary education of a parish school. In his sixteenth year he was apprenticed to a wigmaker in Edinburgh, and soon married (1712) and set up for himself. In 1716 or a little later he gave up wig making and began business as bookseller, first in High Street, under the sign of the Mercury, and afterward in the Luckenbooths, under the heads of

Drummond and Ben Jonson. Here he added to his business a circulating library, the first in Scotland. In 1736 he built a theatre in Carrubbers Close. In the following year the licensing act, prohibiting all dramatic exhibitions without a special license, compelled him to close his theatre. In 1755 he built a quaint and picturesque house on the north side of Castle Hill, where he died, Jan. 7, 1758.

Ramsay's earliest poems were written for the entertainment of the Easy Club (1712–15). After setting up as a bookseller he issued many short humorous pieces, printed as broadsides and sold for a penny each. In 1716 he published the old Scottish poem *Christ's Kirk on the Green*, adding a canto of his own, and two years later still another canto. This was followed by a volume of *Scots Songs* (1719). By this time he was writing in the Horatian manner verse epistles to his friends. His first important publication was a collected edition of his poems in 1721, on which he realized 400 guineas. There followed *Fables and Tales* (1722); *The Fair Assembly* (1723); *Health* (1724); *The Tea-Table Miscellany*, an anthology of Scottish and English songs (vol. i, 1724; vol. ii, 1725; vol. iii, 1727; vol. iv, 1740); *The Evergreen*, a Scottish anthology, containing what is probably his own "Vision" (1724–27); a pastoral drama entitled *The Gentle Shepherd* (1725), to which songs were added (1728); a second collection of poems (1728); *Thirty Fables* (1730). Ramsay's tales and fables are amusing, but coarse. His verse epistles are neat and graceful. His many songs, as "The Yellow-Hair'd Laddie," are the best before Burns. His finest longer lyric is "The Vision." *The Gentle Shepherd*, which reached its tenth edition by 1750, was long held to be the best pastoral comedy ever written. Consult: *Poems*, edited, with a *Life*, by Chalmers (Edinburgh, 1800; reissued and revised, Paisley, 1877); *Poems*, selected, by J. L. Robertson (London, 1887); Oliphant Smeaton, *Life* (Edinburgh, 1890); also *Cambridge History of English Literature*, vol. xi (New York, 1914).

RAMSAY, Allan (1713–84). A Scottish portrait painter, the son of Allan Ramsay, the poet. He was born in Edinburgh and studied there and in London at St. Martin's Lane Academy and later in Rome. On his return he lived for 18 years in Scotland, where he did much of his best work, including the full-length portrait of the Duke of Argyle (Glasgow Gallery). He then removed to London and in 1767 was made court painter to George III. Besides the King and the Queen, whom he painted repeatedly, some of his famous sitters were Lord Bute, Gibbon (National Portrait Gallery), Chesterfield, and Hume. The two last-named canvases, together with the beautiful portraits of his wife and Mrs. Bruce, are in the Edinburgh National Gallery. Ramsay's art lacks spontaneity and power, but it is expressive, graceful, and elegant, and agreeable in color. His peculiar charm is still more visible in his chalk sketches and studies, good collections of which are owned by the Board of Trustees, Edinburgh, and the Scottish National Gallery. One of his portraits of George III is in Independence Hall, Philadelphia.

RAMSAY, Sir Andrew Crombie (1814–91). A Scottish geologist, born in Glasgow. His education at the grammar school in that city being interrupted in 1827 by the death of his father, Andrew entered a counting house and in 1837 attempted business as a dealer in calico and linen. By 1840 this project had proved a failure, but in the following year, at ninepence a day, he was appointed assistant to the Geological Survey. With this he was connected until 1881, becoming local director for Great Britain in 1845, senior director for England and Wales in 1862, and director general in 1871. Upon retiring from active service in 1881 he was knighted. In 1848 he had been appointed to the chair of geology in University College, London, and in 1851 received a like position in the Royal School of Mines. He was president of the Geological Society in 1862–64, became a fellow of the Royal Society in 1862, received the Neill prize from the Edinburgh Royal Society in 1866, the Wollaston medal of the Geological Society in 1870, and in 1880 a Royal Society medal. As a geologist he was a stratigrapher at the expense of paleontology or petrography. His most valuable work on glacial formations, *Old Glaciers of Switzerland and North Wales* (1860), was followed by a series of popular lectures, *Physical Geology and Geography of Great Britain* (1864; 6th ed., 1894). The theory with which he was most closely identified, but which has not received general assent, is that many lake basins have been formed as the result of glacial excavations. Consult Sir Archibald Geikie, *Memoir* (London, 1895).

RAMSAY, Andrew Michael (1686–1743). A writer of Scottish birth who resided in France, where he was known as the Chevalier de Ramsay. He was born at Ayr, studied at the University of Edinburgh, and served with the English auxiliaries in the Netherlands. The mystic Poiret and Fénelon, with whom he became intimate, induced him to adopt Romanism. In 1724 he went to Rome as tutor to the two sons of the Stuart Pretender, Prince James. In 1730 he visited England and was made a member of the Royal Society. Among his works are: *Discours de la poésie épique*, originally printed as preface of *Télémaque* (1717); *Essai philosophique sur le gouvernement civil* (1721); *Vie de Fénelon* (1723), translated into English by N. Hooke; *Les voyages de Cyrus* (1727); *Poems* (1728); etc.

RAMSAY, David (1749–1815). An American physician and author. He was born in Lancaster Co., Pa., and having studied medicine at the University of Pennsylvania, he settled in practice in Charleston, S. C., in 1773. He served as field surgeon in the Continental army during the Revolution. From 1776 to 1783 he was a member of the State Legislature; he was a member of the Council of Safety at Charleston and was a prisoner of the British at St. Augustine, Fla. (1780–81). From 1782 to 1786 Ramsay was a member of the Continental Congress and for the years 1785–86 its president. He was again a member of the South Carolina Legislature (1801–15) and also president of the State Senate. He was shot by a lunatic. Among his works are: *History of the Revolution of South Carolina* (1785); *History of the American Revolution* (1789); *Life of George Washington* (1807); *History of South Carolina* (1809); *History of the United States, 1607–1808* (1816–17).

RAMSAY, James Andrew Broun. See Dalhousie, tenth Earl and first Marquis of.

RAMSAY, Nathaniel (1751–1817). An American soldier. He was born in Lancaster Co., Pa., graduated at Princeton in 1767, was admitted to the Maryland bar in 1771, and in December, 1776, became lieutenant colonel in the Continental army. At Monmouth (q.v.), June 28, 1778, he, together with Colonel Stewart, checked the advance of the English until Washington could rally the main army, but was badly wounded and was taken prisoner. He was exchanged in December, 1780, but retired on Jan. 1, 1781. He was a member of Congress in 1786–87. In 1794 he received the appointment of naval officer for the district of Baltimore, a position he held during five administrations.

RAMSAY, Sir William (1852–1916). A British chemist, nephew of the geologist Andrew Crombie Ramsay. He was born in Glasgow, studied there and at Tübingen, where he received his doctor's degree at the age of 20, was professor of chemistry at University College, Bristol (1880–87), and thereafter was professor in University College, London, until 1913, when he became professor emeritus. With Lord Rayleigh (q.v.) he discovered argon, a new constituent of the atmosphere. Ramsay also discovered other gaseous elements of the air, including neon, xenon, and krypton. He was knighted in 1902 and was awarded the Nobel prize for chemistry in 1904. He translated Beilstein's *Qualitative Analysis* and published: *The Gases of the Atmosphere: The History of their Discovery* (1896; 3d ed., 1905); *Introduction to the Study of Physical Chemistry* (1904); *Essays Biographical and Chemical* (1908); *Elements and Electrons* (1912).

RAMSAY, Sir William Mitchell (1851–). A Scottish classical scholar and Church historian, born in Glasgow. He was educated at Aberdeen, Oxford, and Göttingen, and was elected fellow of Exeter College, Oxford, in 1882, and of Lincoln College in 1885. From 1886 to 1911 he was professor of humanity (Latin) at Aberdeen. Ramsay became widely known for his researches in the history of the Church, in the course of which he traveled extensively in Asiatic Turkey. In 1885 he held the chair of classical art at Oxford and in 1894 was Levering lecturer at Johns Hopkins. He received gold medals from Pope Leo XIII, the University of Pennsylvania, the Royal Geographical and Royal Scottish Geographical Societies, and honorary degrees from many universities. In 1906 he was knighted. His writings include: *The Historical Geography of Asia Minor* (1890); *The Church in the Roman Empire* (2 vols., 4th ed., 1895); *The Cities and Bishoprics of Phrygia* (1895–97); *Historical Commentary on Galatians* (1899); *The Education of Christ* (1902; new ed., 1911); *Letters to the Seven Churches of Asia and their Place in the Plan of the Apocalypse* (1905); *Pauline and Other Studies in Early Christian History* (1906); *The Cities of St. Paul* (1907); *The First Christian Century* (1911); *The Teaching of Paul in Terms of the Present Day* (1913); *The Bearing of Recent Research on the Trustworthiness of the New Testament* (1914).

RAMS'BOTTOM. A town in Lancashire, England, on the Irwell, 4 miles northwest of Bury. Its industries comprise cotton mills, bleaching fields, calico-printing establishments, iron foundries, and stone quarries. Its growth dates from the installation of calico printing by Sir Robert Peel. Pop., 1901, 15,920; 1911, 15,146.

RAMS'DEN, Jesse (1735–1800). An English optician and mechanician, born at Salterhebble, near Halifax, in Yorkshire. He received a good education and, after having first been engaged as a clothworker, became in 1758 an apprentice in the workshop of an instrument maker. In 1762 he started business on his own account and became famous for the excellence of his instruments. He was a skillful engraver and was frequently employed by the best artists. In 1766 he married Dollond's (q.v.) daughter and received as her dowry a share of his father-in-law's patent for achromatic telescopes. The sextants of his time were very imperfect, being untrustworthy within 5′ of a degree, and Ramsden succeeded in reducing the possible error to within 30″. He also invented a dividing machine, which could graduate instruments much more rapidly and accurately than could be done by hand. For this invention he received a reward from the Board of Longitude. He constructed astronomical instruments for many of the great observatories. Ramsden wrote: *Description of an Engine for Dividing Mathematical Instruments* (London, 1777); also the following memoirs read before the Royal Society: "Description of Two New Micrometers" (1777); "A New Construction of Eye-Glasses" (1782).

RAMSES. See Rameses.

RAM'SEUR, Stephen Dodson (1837–64). An American soldier, born at Lincolnton, N. C. He graduated at West Point in 1860 and was assigned to artillery duty at Fortress Monroe. The next year, while serving in Washington, he resigned from the army, April 6, entered the Confederate service, and was made major of North Carolina State troops. He commanded a battery of artillery at the siege of Yorktown, was engaged in the Seven Days' battles and was severely wounded at Malvern Hill, July 1, 1862. As brigadier general he took the field again soon after Fredericksburg. At Chancellorsville he led the advance of Rodes's division and won special commendation from both Lee and Jackson. On July 1, 1863, at Gettysburg, he helped to take possession of the town. He was engaged in the battles around Spottsylvania Courthouse, and was again severely wounded when driving Hancock from the Confederate works. With rank of major general he took part in Early's raid and was engaged at Harper's Ferry and at the Monocacy. At Winchester his division was the first to be attacked, but retreated in good order. While covering the retreat at Cedar Creek, October 19, he was mortally wounded and captured.

RAMSEY, răm'zĭ, Alexander (1815–1903). An American administrator, war Governor of Minnesota, born near Harrisburg, Pa., and educated at Lafayette College. He took a prominent part in politics as a member of the Whig party, and in 1849 was appointed Territorial Governor of Minnesota. In that capacity he made treaties with the Sioux and Chippewas by which much valuable land was opened to settlers. From 1859 to 1863 he was Governor of the State of Minnesota. He became United States Senator in 1863, was reëlected in 1869, was Secretary of War under President Hayes, and from 1882 to 1886 was chairman of the Utah commission on polygamy appointed under the Antipolygamy Act of 1882, whose passage was procured by Senator George F. Edmunds (q.v.).

RAMS'GATE. A seaport and favorite watering place on the Isle of Thanet, County of Kent, England, 65 miles southeast of London (Map: England, H 5). The town consists of well-arranged streets, crescents, and terraces; the older part, situated in a natural depression or cutting in the chalk coast, opens out towards the sea. The principal buildings are a Benedictine monastery and college and a small but beautiful Roman Catholic abbey church. The harbors, 47 acres in extent with 3300 feet of quayage, serve as harbors of refuge for the Downs. Ramsgate has shipbuilding and fishing industries and a small coasting trade. Anciently a fishing village, it increased in importance about the beginning of the eighteenth century, when a successful trade with Russia and the east country was opened up. The chief imports are timber, ice, and stone. The municipality, incorporated in 1884, provided an iron promenade pier, public parks, and esplanades. On Ossengal Hill, 1 mile west of the town, are the remains of a Saxon cemetery. Pegwell Bay, to the west, is the traditional landing place of Hengist and Horsa, and a monolithic cross at Cliff's End (Ebbsfleet) marks the landing place of St. Augustine in 596. Pop., 1901, 27,693; 1911, 29,603. Consult Simson, *Historic Thanet* (London, 1891), and "Ramsgate Reviewed," in *Municipal Journal* (ib., 1900).

RAM′SONS. A weed. See Allium.

RA′MUS, Petrus (Latinized form of *Pierre de la Ramée*) (1515–72). A French humanist, philosopher, and mathematician, born at Cuth, Vermandois, the son of a charcoal burner of noble descent. In his twelfth year he became servant to a rich student at the Collège de Navarre, and by devoting the day to his master obtained the night for study and made rapid progress. He was profoundly dissatisfied with the scholasticism and authoritarianism of the day, and showed his contempt for the idol of the times by maintaining as his thesis for his master's degree in 1536 that all that Aristotle had said was false. Ramus, with two learned friends, opened a special class for reading the Greek and Latin authors, designed to combine the study of eloquence with that of philosophy. His attempts to reform the science of logic excited much hostility among the Aristotelians, and when his treatise on the subject (*Animadversiones in Dialecticam Aristotelis*) appeared in 1543, it was fiercely assailed by the doctors of the Sorbonne, who managed to get it suppressed by an edict of Francis I. But Ramus had powerful friends, through whose influence he was, in 1545, appointed principal of the Collège de Presles, which he raised from a condition of decay to the most splendid prosperity. In 1551, under Henry II, the Cardinal of Lorraine succeeded in instituting for him a chair of eloquence and philosophy at the Collège de France. He had long been suspected of a leaning towards Protestantism, and he ventured formally to abjure the old faith. The outbreak of the religious wars drove him from France to Germany and Switzerland, where he continued his academic activity. Unfortunately he returned to Paris in 1571 and was one of the victims of the Massacre of St. Bartholomew. His followers, known as Ramists, were a widespread and for a long time a powerful body of thinkers and teachers. Consult: Charles Waddington, *Ramus: sa vie, ses écrits et ses opinions* (Paris, 1855); Charles Desmaze, *Ramus* (ib., 1864); P. Lobstein, *P. Ramus als Theolog* (Strassburg, 1878); Voigt, *Ueber den Ramismus der Universität Leipzig* (Leipzig, 1888); F. P. Graves, *Peter Ramus and the Educational Reformation of the Sixteenth Century* (New York, 1912).

RAMUSIO, rȧ-mo͞o′zē̇-ō̇, Giambattista (1485–1557). An Italian compiler, born at Treviso. He was Ambasssador of Venice to France, Switzerland, and Rome, and subsequently held the post of secretary to the Council of Ten. He published *Delle navigationi e viaggi, etc.*, a remarkable collection of travels and voyages (1550, 1559, 1566), containing much material important for the history of early America. The best edition was published in Venice in 1606.

RANC, räɴk, Arthur (1831–1908). A French politician and author, born at Poitiers. He studied law in Paris and took such a violent part in the Republican activities under the Empire that he was deported to Lambessa, accused of an attempt upon the life of the Empress. But he escaped and went to Switzerland. After the amnesty of 1859 he returned to Paris and contributed to the *Opinion Nationale*, the *Nain Jaune*, and other journals. Because of the tone of some of these articles he was imprisoned for four months. In 1870 he was elected maire of the ninth arrondissement of Paris, and joined Gambetta, who gave him the directorship of police, a post in which he highly distinguished himself. The following year he was elected to the National Assembly, but he voted against the arrangements for peace with Germany and resigned to become a member of the Commune. The violence of that body was contrary to his own views and he resigned from it also. Afterward the Monarchist press attacked him and his organ, the *République Française*, for the part he had taken during the Commune, and after he had been elected from the Department of Rhône to the National Assembly of 1873 he was condemned to death *in contumaciam*. He had escaped to Belgium, where he remained until the amnesty of 1879. Ranc had continued his connection with the *République Française* and became director of the *Petite République* in 1880. In 1881 he was elected deputy from the Seine and in 1891 Senator. In 1900 he declined reëlection and became editor of the *Radical*. But three years later he was reëlected to the Senate from Corsica. In 1905 he replaced Clemenceau as editor of *Aurore*. He was consistently Republican throughout the Boulanger difficulties, and he took a leading part in the revision of the Dreyfus case. His works include: *Le roman d'un conspiration* (1868); *Sous l'empire* (1872); *De Bordeaux à Versailles* (1877).

RANCAGUA, rȧn-kä′gwȧ. The capital of the Province of O'Higgins, Chile. It is situated in a rich agricultural district on the railroad 40 miles south of Santiago. In 1814 it was the scene of an important battle in which the patriot forces were defeated by the Spaniards. Pop., 1907, 10,380.

RANCÉ, räɴ′sȧ′, Armand Jean le Bouthillier de (1626–1700). The founder of the reformed order of La Trappe. (See Trappists.) He was born in Paris. After taking his degree at the Sorbonne he became distinguished as a preacher, and through the favor of his godfather, Cardinal Richelieu, obtained valuable benefices. He succeeded while yet a young man to his father's large fortune and lived a careless and irregular life. In 1662, however, having forfeited the favor of Cardinal Mazarin, and deeply moved by the sudden death of the Duchess de Montbazon, to whom he was much attached, he retired to the abbey of La Trappe, in Normandy, with the intention of restoring the strict discipline of the order. He was abbot from 1664 to 1695, when ill health compelled his retirement. The only remarkable event of his literary life was a controversy with Mabillon, in which he opposed study as a part of the monastic life. He also wrote *De la sainteté et des devoirs de la vie monastique* (1683; Eng. trans., *A Treatise on the Sanctity and on the Duties of the Monastic State*, Dublin, 1830). Consult Du Bois, *Histoire de l'abbé de Rancé et de sa réforme* (2d ed., 2 vols., Paris, 1869), and M. L. Serrant, *L'Abbé de Rancé et Bossuet, ou le grand moine et le grand évêque du grand siècle* (ib., 1904).

RAND. A popular designation for the gold-bearing Witwatersrand (q.v.) reef in the Transvaal Province, South Africa.

RAND, EDWARD KENNARD (1871–). An American classical scholar, born in Boston. He graduated from Harvard in 1894 and subsequently studied at Harvard Divinity School, at the Episcopal Theological School, Cambridge, and at Munich, where he took his Ph.D. in 1900. He taught Latin at the University of Chicago (1895–98) and at Harvard after 1901, becoming professor in 1909. In 1912–13 he was professor at the American School of Classical Studies in Rome. Besides numerous articles in the periodicals he published *Dante Alighieri Operum Latinorum Concordantiæ* (1912) with E. H. Wilkins.

RANDA, rän'då, ANTON, KNIGHT VON (1834–1914). An Austrian jurist, born at Bristritz, Bohemia. He studied law at Prague, where he afterward (1868) became professor of Austrian civil law. In 1881 he was appointed life member of the Austrian House of Peers, and soon afterward he was made a member of the Imperial Court of Justice. He is considered one of the highest authorities on Austrian civil law. His publications include *Der Besitz nach österreichischem und römischem Rechte* (1865; 4th ed., 1895), his chief work; *Der Erwerb der Erbschaft* (1867); *Oesterreichisches Handelsrecht* (1904; 2d ed., 1911); *Schadenersatzpflicht* (1907).

RAN'DALL, JAMES RYDER (1839–1908). An American poet and journalist, born in Baltimore. After studying at Georgetown College, where, on account of ill health, he did not graduate, he traveled in South America, but he returned to the United States and began newspaper work in Louisiana before the beginning of the Civil War. The news of the fighting in Baltimore when the Massachusetts troops passed through the city inspired him to write "Maryland, my Maryland," which was at once set to music and with "Dixie" became the most popular of Confederate songs. Randall wrote other war lyrics, some good, but none of the calibre of his first. For many years after the war he was editor of the *Constitutionalist* of Augusta, Ga., and in 1905 he became editor of the New Orleans *Morning Star*. Consult his *Poems*, edited by M. P. Andrews (New York, 1910).

RANDALL, SAMUEL JACKSON (1828–90). An American political leader and legislator, Speaker of the National House of Representatives from 1876 to 1881. He was born at Philadelphia and was educated there at the University Academy. He was early a prominent Whig and then a member of the Democratic party. In 1858 he was elected to the State Senate. At the outbreak of the Civil War he went to the front as a private in the First Philadelphia City Troop. At the time of Lee's invasion of Pennsylvania in 1863 he recruited a company of which he became captain, and served also as a provost marshal. For 14 consecutive terms he was a member of Congress. He served on the Committee on Rules (1873–75) with Blaine, Banks, Garfield, and Cox, and by directing the Democratic opposition to the Force Bill won general recognition as the leader of his party in the House, discipline and party harmony being established among the Democrats for the first time since the Civil War. In the Forty-fourth Congress he was appointed chairman of the Committee on Appropriations. In December, 1876, he was elected to succeed Speaker Kerr, who had died during the recess of Congress, and thus was called upon to preside during the exciting and critical period of the disputed Hayes-Tilden election. He was reëlected Speaker of the Forty-fifth and Forty-sixth Congresses (1877–81). After about 1883 Randall became the leader of a small group of Democrat protectionists who consistently opposed all attempts at tariff reform.

RANDAZZO, rân-dät'sō. A town in the Province of Catania, Sicily, situated on the north slope of Mount Etna, 26 miles by rail north-northwest of Catania (Map: Italy, E 6). The town is built of lava from Mount Etna and is remarkable for never having been destroyed by the volcano. There is trade in wine, oil, and cheese. Pop. (commune), 1901, 11,798; 1911, 13,656.

RANDEGGER, rän'dĕg-gẽr, ALBERTO (1832–1911). An Austrian-English composer, born at Triest. He was a pupil of Lafont in piano and of Luigi Ricci in composition and, with two other young composers, produced two ballets and an opera, *Il Lazzarone*, in 1852. In 1854 he produced his opera *Bianca Capello* at Brescia. As teacher of singing in London, where he settled about 1855, he became well known, and in 1868 was appointed professor of singing at the Royal Academy of Music. In 1857 he conducted Italian opera at the St. James's Theatre and was musical director of the Carl Rosa Opera Company from 1879 to 1885, and, upon the resignation of Benedict in 1881, became conductor of the Norwich Musical Festival, which he directed until 1905. He wrote a comic opera, *The Rival Beauties* (1864); a dramatic cantata, *Fridolin* (1873); two scenas for soprano and orchestra, *Medea* (1869) and *Sappho* (1875); the *150th Psalm* for soprano solo, choir, orchestra, and organ; *Funeral Anthem*, in memory of the Prince Consort; numerous other vocal pieces; and a well-known *Primer of Singing*.

RANDERS, rân'ĕrs. A town of Jutland, Denmark, situated at the entrance of the Gudenaa into the Randers Fiord, 22 miles northwest of Aarhus (Map: Denmark, D 2). The chief manufactures are railroad cars, gloves, oleomargarine, and the chief exports grain, butter, eggs, fish, and wool. Pop., 1901, 20,057; 1911, 22,970.

RAN'DOLPH. A town in Norfolk Co., Mass., 15 miles south of Boston, on the New York, New Haven, and Hartford Railroad (Map: Massachusetts, E 4). It contains the Boston School for the Deaf and the Turner Library. The chief manufactures are shoes, boxes, and poultry houses. Pop., 1900, 3993; 1910, 4301.

RANDOLPH. A town, including several villages, in Orange Co., Vt., 25 miles south by west of Montpelier, on the Central Vermont Railroad (Map: Vermont, D 5). It is the seat of the State Agricultural School, and has a public library. The surrounding district is chiefly engaged in farming and lumbering. Furniture, wood finishings, and plows are manufactured here. Pop., 1900, 3141; 1910, 3191.

RANDOLPH, Edmund Jennings (1753–1813). An American statesman, the nephew of Peyton Randolph (q.v.). He was born in Williamsburg, Va., graduated at William and Mary College, studied law with his father, early became prominent as an opponent of the measures of the British ministry, and in consequence was disinherited by his father, John Randolph, a stanch Loyalist. In August, 1775, he became one of Washington's aids and in 1776 sat in the Virginia Constitutional Convention. He was chosen first Attorney-General under the new State Constitution (1776), sat in the Continental Congress from 1780 to 1782, and was Governor of Virginia from 1786 to 1788. In 1787 he headed the Virginia delegation to the Constitutional Convention and took a prominent part in the debates, proposing the celebrated Virginia plan and opposing among other things the single executive, the vice presidential office, and equality of the States in the Senate. He refused to sign the instrument as finally drafted, but in the Virginia Convention strongly advocated its ratification. He helped to codify the Virginia laws and in September, 1789, was appointed by Washington Attorney-General of the United States. On Jan. 2, 1794, he succeeded Jefferson as Secretary of State, but resigned in August, 1795, primarily on account of an intercepted dispatch of the French Minister Fauchet by a British man-of-war and sent to the British Minister to the United States, which led to charges being brought against him reflecting on his honor. Most of these charges have in recent years been effectually disproved. Returning to his home, he became the leader of the Virginia bar, and in 1807 helped defend Aaron Burr against the charge of treason. He wrote a *History of Virginia,* which, though never published, has been much used in manuscript by other historians. He also wrote (and published) *A Vindication of Mr. Randolph's Resignation* (1795) and pamphlets entitled *Democratic Societies* (1795) and *Political Truth* (1796). Consult Conway, *Omitted Chapters of History Disclosed in the Life and Papers of Edmund Randolph* (2d ed., New York, 1889).

RANDOLPH, Edward (c.1620–c.1694). A British colonial agent. He was sent to the New England Colonies in 1675 to investigate their condition and impose on them certain royal demands; but Governor Leverett of Massachusetts having refused to recognize Randolph's commission, after six weeks he returned to England. Hoping to evoke oppressive taxation from Parliament and to keep himself occupied, he presented an exaggerated report of the wealth and population of the Colonies. During the next nine years he made eight voyages to New England, and each time brought back a false report. As a collector of customs in Massachusetts after 1679 he urged upon the home government the adoption of punitive measures, the outcome being the forfeiture of the Massachusetts charter in 1684. Randolph was a member of the council of the new Governor, Sir Edmund Andros (q.v.), from 1686 until 1689, when the Andros régime came to its sudden end. Then he left for the West Indies, where he died.

RANDOLPH, John, of Roanoke (1773–1833). An American statesman, born at Cawsons in Chesterfield Co., Va., June 2, 1773; died in Philadelphia, June 24, 1833. He was descended from an old and wealthy Virginia family and boasted Pocahontas as one of his ancestors. Educated at Princeton and Columbia colleges, he began the practice of law, but in 1799 he was elected to Congress, where he became distinguished for his eloquence, wit, sarcasm, invective, and eccentricity. At a very early stage in his career he was the Democratic-Republican leader of the House of Representatives. He denounced the settlement of the Yazoo land dispute effected by Madison and Gallatin. In 1804 he introduced a resolution impeaching Justice Samuel Chase (q.v.) and was the foremost prosecutor in the famous trial in the following year. He ultimately broke with Jefferson and lost his influence, although as a free lance and hurler of invectives he never ceased to be feared. He opposed the War of 1812 and the Missouri Compromise and stigmatized the Northern members who voted for the latter as "doughfaces." In 1822 and 1824 he visited England, where his eccentricities attracted much notice. In 1825 he began his two years' service as Senator from Virginia and fought his famous duel with Henry Clay. In 1830 he was appointed Minister to Russia, and gave much occasion for scandal by his short stay and heavy demands on the Treasury. By his will he manumitted his 318 slaves and provided for their maintenance in a free state. In some respects full justice has never been done to Randolph's intellect. He was not merely a well-read man and possessed of a good style, as appears from his *Letters to a Young Relative* (1834) and many of his speeches in Congress, nor was he simply an unparalleled master of invective; he was also a far-sighted statesman, who foresaw the direction American politics would take with regard to the question of slavery and outlined the policy of Southern defense afterward taken up by Calhoun and his followers. He was considered a Virginian of Virginians, upon whom young Southern extremists modeled themselves. Consult: H. A. Garland, *Life of John Randolph of Roanoke* (2 vols., New York, 1857); W. P. Trent, *Southern Statesmen of the Old Régime* (ib., 1896); Henry Adams, *John Randolph,* in the "American Statesmen Series" (ib., 1899).

RANDOLPH, Peyton (1723–75). An American patriot of the Revolutionary period. He was born at Williamsburg, Va., graduated at William and Mary College, studied law at the Inner Temple in London, and in 1748 became the Royal Attorney-General for the Colony of Virginia. In the same year he became a member of the Virginia House of Burgesses and served as chairman of a committee to revise the laws of Virginia. In 1764 he framed the remonstrance of the Burgesses against the threatened Stamp Act. The following year, however, he opposed Patrick Henry's radical

Stamp Act Resolutions. In 1766 he resigned the office of Attorney-General and devoted himself to furthering the cause of the Patriot or Whig party, serving as chairman of the Committee of Correspondence and as president of the Virginia Convention of 1774. In the latter year he was chosen a delegate to the Continental Congress at Philadelphia, and was unanimously elected president of that body upon its assembling at Carpenter's Hall, September 5. In 1775 he was again elected to the Continental Congress and again chosen president. In the same year he presided over the second Virginia Convention and served as Speaker of the House of Burgesses. Shortly after his return to Congress he died suddenly of apoplexy.

RANDOLPH, Thomas (1523–90). An English courtier and diplomat. He was educated at Oxford and remained there until the Protestant persecutions in Mary's reign. Elizabeth sent him on missions to Germany and Scotland, where he mingled in all the complex political dealings between England and Scotland from 1559 until 1586. Mary, Queen of Scots, banished him from her court in 1566 on the charge of being concerned in Murray's rebellion. (See Murray, or Moray, James Stuart, Earl of.) He was afterward sent on embassies to Russia (1568) and Paris (1573, 1576).

RANDOLPH, Thomas (1605–35). An English playwright, educated at Westminster School and at Trinity College, Cambridge, of which he was elected a fellow in 1632. Except for visits to London, where he met Ben Jonson and other wits at the Devil Tavern, he passed his time at the university. He gained a reputation for graceful Latin and English verse and for dramatic performances arranged for the students. *Aristippus, or the Jovial Philosopher* (1630), a drama in verse and prose, is a satire on university education. With it was published the *Conceited Pedler,* a monologue of a rogue much like Shakespeare's Autolycus. There appeared posthumously a volume entitled *Poems, with the Muses' Looking-Glasse and Amyntas* (1638). *The Muses' Looking-Glasse* is a witty comedy and *Amyntas* is a pastoral drama adapted from the Italian. To Randolph have been ascribed a pleasant comedy, *Hey for Honesty* (published 1651), and a Latin comedy, *Cornelianum Dolium* (1638). Consult his *Poetical and Dramatic Works,* edited by W. C. Hazlitt (2 vols., London, 1875).

RANDOLPH, Thomas Jefferson (1792–1875). An American statesman, born at Monticello, Va. He was the oldest grandson of Thomas Jefferson and paid the debts that Jefferson left at his death. He also acted as Jefferson's literary executor, and in 1829 published *Life and Correspondence of Thomas Jefferson* (4 vols.). As a member of the Virginia Legislature he in 1829 introduced a postnatal plan for the gradual abolition of slavery, but the bill was defeated in the following year. In 1851–52 he was a member of the State Constitutional Convention, and for seven years was rector of the University of Virginia. In 1872 he presided over the Democratic National Convention that nominated Horace Greeley for the presidency.

RANDOLPH-MACON SYSTEM OF COLLEGES AND ACADEMIES. A system of five collegiate and preparatory institutions in Virginia, under Methodist auspices, managed by one board of trustees and comprising a college for men, with two academies, and a college for women, with one institute. The organization is designed to secure close correlation between the preparatory school and the college, with economy of time and expense to both. *Randolph-Macon College,* for men, the parent institution of the system, was chartered in 1830 and opened in 1832 at Boydton, Va. The college was closed during the Civil War and was reopened in 1866. In 1868 it was removed to its present situation, at Ashland, Va. It has no professional schools. The course is partially elective and leads to the degrees of bachelor of arts, and master of arts, and bachelor of science. Students for any ministry are exempt from tuition fees. The college had in 1914–15 a faculty of 15 instructors and 190 students of collegiate grade. The productive fund amounted to about $335,000 and the income to about $40,000. Grounds and buildings were valued at $149,129, the total value of the college property being estimated at more than $500,000. The library contains 16,000 volumes. The feeding schools of the college are the *Randolph-Macon Academy,* at Bedford City, Va., established in 1890, and the *Randolph-Macon Academy,* at Front Royal, Va., established in 1892.

Randolph-Macon Women's College was founded at College Park, Lynchburg, Va., in 1893. The foundation was due largely to the subscriptions secured from the citizens of Lynchburg and by Dr. W. W. Smith, the founder and first president of the college. The institution was placed under the care of the Randolph-Macon board of trustees and rapidly rose to a leading position among the women's colleges in the United States. In 1906 the college was admitted to the benefit of the Carnegie Fund, but voluntarily withdrew in 1909. In 1914–15 there were enrolled 610 students, of whom 511 were candidates for the A.B. degree. In the same year there were 45 instructors. The endowment in 1915 amounted to about $385,000 and the income from all sources to about $185,000. The buildings and grounds were valued at $462,240. The library contains about 13,000 volumes. The president in 1915 was Dr. William Alexander Webb. Its preparatory school, the *Randolph-Macon Institute,* at Danville, Va., was admitted in 1897.

RANELAGH, răn′e-lȧ. A fashionable resort in Chelsea, London, during the eighteenth century. The plot of ground, occupied from 1742 to 1803 by gardens and a building called the rotunda, was acquired by the Earl of Ranelagh about 1690, and here Ranelagh lived until 1712, but in 1741 the rotunda was erected and the following year the place was opened to the public. The rotunda was built in imitation of the Pantheon at Rome, and could accommodate more than 6000 guests. In 1803 the rotunda was closed, and subsequently all the buildings were removed and the grounds were made part of those of Chelsea Hospital. Consult Warwick Wroth, *The London Pleasure Grounds of the Eighteenth Century* (New York, 1896).

RANENBURG, rä′nyen-bōōrg. A town in the Government of Riazan, Russia, about 230 miles southeast of Moscow (Map: Russia, F 4). The place was granted in 1702 by Peter I to Menshikov. It subsequently served as a place of exile for Menshikov himself and for Anna Karlovna. Pop., 1910, 5834.

RANGABÉ, rän̲′gȧ-vē′, or Rhangabe, Rhankaves, Rhangawis, Alexandros Rizos (1810–92). A Greek author and statesman, born in Constantinople and educated at Odessa and in the Military School at Munich, whence he entered the Bavarian artillery. In 1831 he returned to Greece and entered governmental employ, serving for several years in the department of the Ministry of Education. There he founded a new school system, primary and secondary, and established the Greek Archæological Society. In 1844, after two years in the Department of the Interior, he was expelled because of his foreign birth. He was called in 1845 to the chair of archæology in the University of Athens, was Minister of Foreign Affairs (1856–59), became Minister at Washington (1867), at Paris (1868), and at Berlin (1874–86), where he supported Delyannis (q.v.) before the Congress of Berlin. He was a leader of the classicists who urged a return to ancient Greek, in which he wrote versions of Dante, Goethe, and Lessing, lyric, epic, and dramatic poetry, and a valuable volume on Greek archæology. In French he wrote *Antiquités helléniques* (1842–55) and *Histoire de la littérature néo-hellénique* (1877; in German, 1884; in Greek, 1888). His archæological dictionary (1888 et seq.) was not completed. A collection of his works in 13 volumes appeared in 1874.

RANGE (from OF., Fr. *ranger*, to align, from *rang*, line, from AS., OHG. *hṛing*, *hrinc*, Ger. *ring*, Eng. *ring;* connected with OChurch Slav. *krangu*, circle, with Lat. *circus*, Gk. *κρίκος*, *krikos*, ring, or with Skt. *srnkhala*, chain). In gunnery, the extreme distance a projectile can cover after leaving the muzzle of the piece from which it was discharged. The maximum range of a gun is the greatest distance to which it will throw its projectile under ordinary conditions of loading. This occurs for any given conditions when the gun is at an elevation of approximately 40°. The range, in addition to the elevation at which the gun is fired, depends on the initial velocity given the projectile and the weight and diameter of it. It will therefore be seen that for any gun the range and the effect of the projectile at this range must first be decided upon, after which the gun and the projectile are designed to meet these requirements. The maximum range for the United States 16-inch breech-loading rifle mounted in the Panama fortifications is about 21 miles. By increasing the velocity this range would be still greater. Increasing the velocity, however, produces such a wear on the gun that it would be unserviceable after a comparatively small number of rounds.

The effective range, or the range at which the projectile may be counted upon to perform the work for which it is intended, is usually much smaller than the maximum range, and of course is of more importance than the maximum possible range. The limit of the effective range has been the subject of endless and heated argument for several years. It is evident that this limit must to a large extent depend on personal opinion. The points to be considered are many. The main consideration is the difficulty of supplying ammunition. The supply of ammunition to the firing line of infantry troops is especially difficult, and though the ranges for using rifle fire have lately been greatly increased, it is probable that as compared with larger guns this increase in range is very little. The reason assigned is that the chance of hitting intrenched or deployed infantry soldiers at long ranges is so small that were the soldier allowed to fire he would do little damage to the enemy, and by the time the enemy was so near as to make it possible to "aim at the white of the enemy's eyes" the ammunition would be expended.

The same condition is true as regards artillery fire. For this the question of the life of the gun together with the expense of and facility for replacing or relining it must also be considered. As a consequence the almost general standard adopted by all countries until very recently was to construct the carriages or mounts so that the guns could be given a maximum elevation of approximately 15°. This corresponds to maximum ranges from about 6500 yards for guns of 3-inch calibre to about 19,000 yards for the 16-inch gun. This does not apply to howitzers or mortars, where higher elevations are used in order to give the projectile a steeper fall.

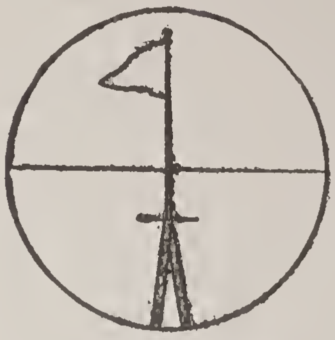
Recently some of the conditions which previously limited firings to ranges corresponding to 15° elevation have changed, observing instruments and range finders (q.v.) have been greatly improved, and it is now possible to see at much greater distances. Motor trucks lessened the difficulties incident to supply of ammunition. Aëroplanes offered a means of obtaining exact information concerning the location of hostile troops. By the use of these modern appliances longer range findings have been made possible. These changed conditions, however, found every country well supplied with guns of shorter ranges, with the result that only the nations pursuing an energetic military policy started to increase the permissible ranges. Germany provided herself with larger guns in which elevations up to 40° could be used, but other countries did not immediately follow her lead. She provided herself with a large number of these, and the tremendous advantage attained during the European War because of this policy is well known. The old idea was blasted, and where in previous wars mid-range firings of 3000 or 4000 yards was the rule, in this war firings at ranges from this range up to 15,000 yards became the practice.

The same general condition is true of naval and seacoast guns. The demands for long ranges are so great that guns constructed in the future will have to be more powerful than ever thought of before, and it is safe to assume that the artillery of the various nations will have to be replaced with long-range guns of high power and mounted so as to get the maximum effective elevation. With more powerful guns the expense will be much greater, since the guns will become unserviceable much sooner. See Ballistics; Field Artillery; Gunnery; Ordnance; Small Arms.

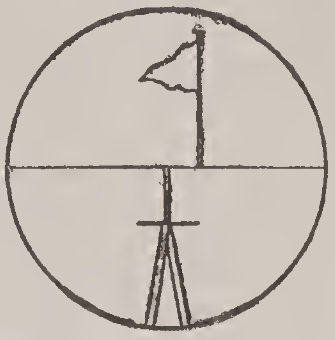
RANGE FINDER. An instrument used in naval and military operations to determine the distance of the object to be hit from the gun which is firing. (See Range.) Several types have been tried, but the only ones now in general use are autobase instruments. The best-known examples are the Barr and Stroud, the Bausch and Lomb, and the Lewis. The first two are used in the navy and have a horizontal base. The Lewis has a vertical base and is used in the army. Vertical-base instruments are not well suited for shipboard observations on account of the difficulty of taking observations when the vessel is rolling.

The Barr and Stroud and the Bausch and Lomb range finders are of the same general construction, but differ in optical details. Each consists of a long horizontal tube, supported on a vertical pivot, with a reflecting prism at each end. These prisms bring the images of the object to the centre of the tube, where the eyepieces (like those of binocular glasses) are located. The instrument (like those of a vertical type) is designed to solve a right triangle of which the base is the distance between the reflecting prisms and the altitude is the distance of the object. The angle between the axis of the tube and the line of sight to the object is 90° at one end of the tube and somewhat less than 90°—depending upon the distance—at the other. The difference between the two angles is equal to the angle subtended by the instrument at the object observed, and it is this angle which is measured. In measuring it the distance is automatically determined.

The accompanying sketch shows the arrangement of the Barr and Stroud range finder. At the ends of the outer tube are the pentagonal prisms *A* and *B*, the reflecting surfaces of which are silvered. If the object (such as a star) is at a great distance, the rays of light from it are represented by *KA* and *MB*. If the object is comparatively near, the rays from it are *LA* and *MB*. The optical arrangement is such that *MB* is kept perpendicular to the axis of the tube. *LA* is inclined to the axis at an angle whose magnitude depends upon the distance. The operation of measuring the angle is effected by the deflecting prism *E*, which is moved to the right as the range increases. By this means the path of the ray *LA* (after passing through the prism *A*) is bent until it enters the prism on the left side of the right eyepiece in such a manner as to be deflected to the line of sight. The distance the prism *E* has to be moved determines the range, the scale of yards moving above the image in the finder, which is seen in the field of the left eyepiece. To assist in bringing the rays *LAH* and *MBH* into exact coincidence in the field of the right eyepiece, the object is divided horizontally, the upper part coming from one side and the lower part from the other. When the two parts join exactly the adjustment of *E* is correct. If necessary the object may be lengthened vertically by means of an astigmatizer. It is then easy to determine exact coincidence.



FIELD OF RIGHT EYEPIECE.
Images in coincidence.



FIELD OF RIGHT EYEPIECE.
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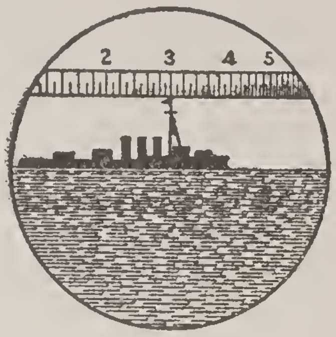
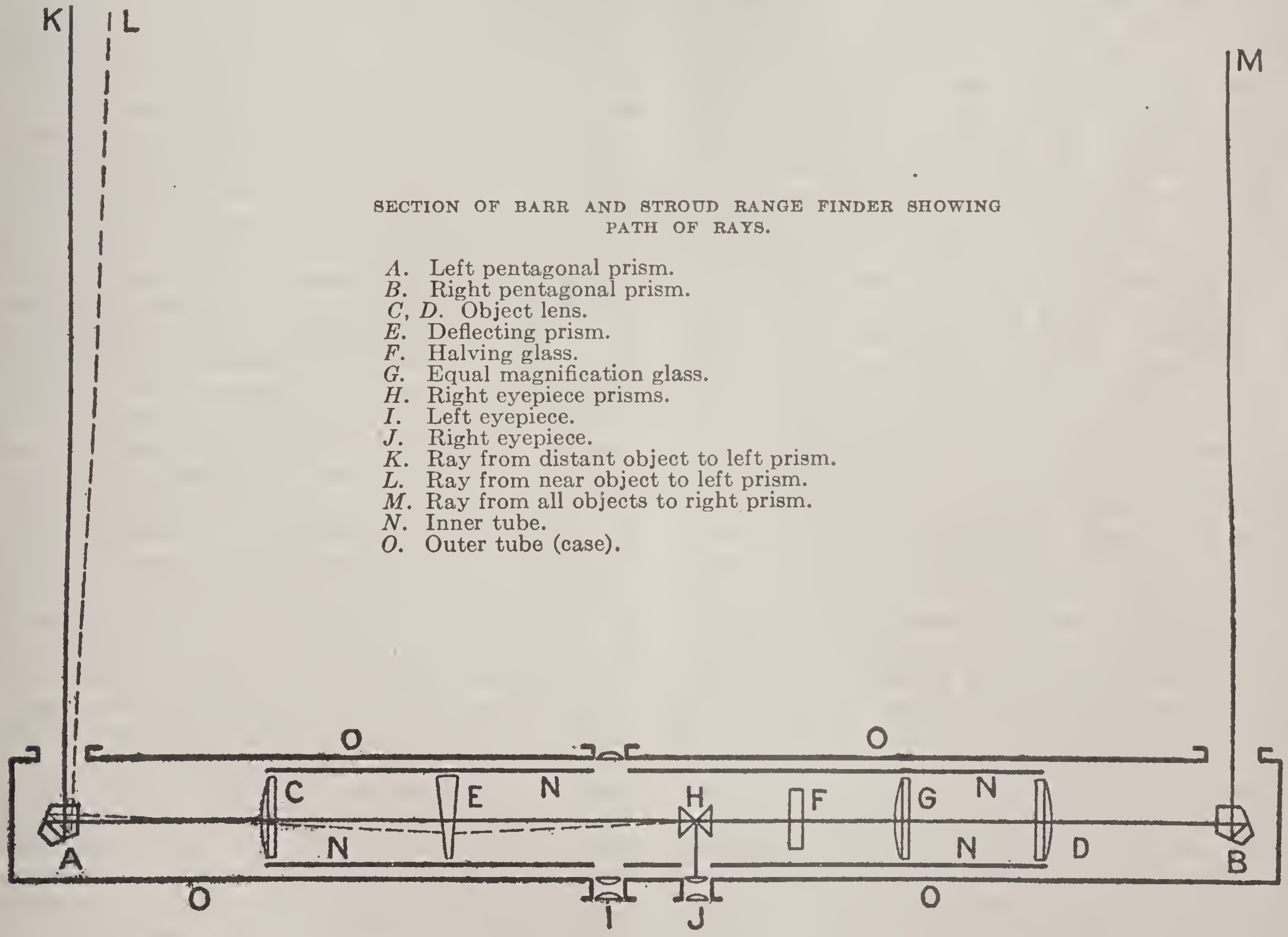


FIELD OF LEFT EYEPIECE.



SECTION OF BARR AND STROUD RANGE FINDER SHOWING PATH OF RAYS.

- *A.* Left pentagonal prism.
- *B.* Right pentagonal prism.
- *C, D.* Object lens.
- *E.* Deflecting prism.
- *F.* Halving glass.
- *G.* Equal magnification glass.
- *H.* Right eyepiece prisms.
- *I.* Left eyepiece.
- *J.* Right eyepiece.
- *K.* Ray from distant object to left prism.
- *L.* Ray from near object to left prism.
- *M.* Ray from all objects to right prism.
- *N.* Inner tube.
- *O.* Outer tube (case).

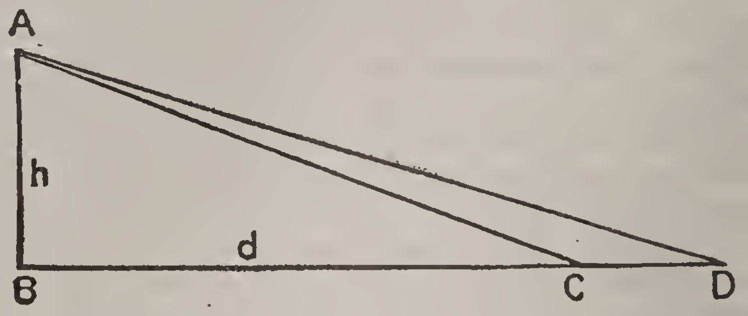
To facilitate the operation of the instrument a finder is fitted. This is in effect an ordinary telescope with a field sufficiently large for the operator to pick up quickly the object which is to be observed and direct the instrument to it. Such an arrangement is necessary because the high magnification of the contacting eyepiece causes its field to be very small.

The error of a range-finder determination depends upon the proficiency of the observer, the length of the instrument, the degree of magnification, the condition of the atmosphere, the character of the object, and its direction with reference to the sun. Objects near the sun are poorly defined and the sunlight dazzles the observer. If the object has well-defined points or vertical lines (e.g., masts or smoke pipes), the determination is easy. Points or lights may be astigmatized before attempting to measure the distance. The condition of the atmosphere affects visibility and clear definition of the object. The average error is (other things being equal) exactly proportional to the length of the instrument. Thus, an error of 10 seconds of arc in measuring the angle with an 18-foot instrument would give half the range error of a similar angular error in a 9-foot instrument. Since the human eye cannot distinguish an error of less than 10 seconds of arc, it is important that great distances be determined by long range finders and that the magnification be as great as the optical conditions will permit.

Although range finders are of the utmost importance in ascertaining the distance of objects at which guns are aimed, the distance as given by them does not wholly control the setting of the gun sight. On account of the variation in muzzle velocity, due to the effect of atmospheric conditions on the powder and to other causes, the range-finder reading is modified in setting the sights, the correction being made from observations of the fall of the projectiles. If they strike the water surface before reaching the target or the enemy, the sight-bar range is increased, no matter what the range finder shows, as it is evident that the sight scale is not quite correct for existing conditions. In fact, the range finder is, in naval warfare, used chiefly (*a*) at the beginning of an action, (*b*) when ranges are changing rapidly, (*c*) when the fall of the projectiles cannot be determined with accuracy, and (*d*) when the object of attack is changed. Long-base range finders, on account of their weight and size, are used chiefly on board ship, with siege-train apparatus, or in fortifications.

The United States coast artillery in the coast defenses uses a horizontal base line established by survey and from 1000 yards to 3000 yards long according to the site. This base line is equipped at one end with an azimuth instrument and with a D.P.F. (depression position finder) at the other. These base-end stations are themselves coördinated by an electric bell that rings at fixed and regular intervals of time, so as to obtain synchronous observations. These observations are sent in to a third station, where the graphical plot is made and range corrections applied before the communication of the data to the battery interested. In addition to the horizontal-base system the coast artillery also uses self-contained and vertical-base instruments.

Before the development of accurate autobase range finders and of precision in gunfire, range finding was effected by three other methods. The first was by simultaneous observations from two stations separated by a known distance which formed the base. This method is still used in military operations. The second, called Buckner's method, was used only at sea. An observer at A, h feet above the water surface (BCD), measured the angle (DAC) between the object (C) and the horizon (D). By means of suitable tables the range or distance (BC) was derived. The third method was by observing the time between the flash and the report of the enemy's guns and multiplying this by the velocity of sound in air. This method was abandoned many years ago as no longer practicable.



An important use for a ship's range finders is in navigation, where they are employed to determine the distances of land, lighthouses, buoys, beacons, rocks, etc.

Consult textbook on *Naval Ordnance*, United States Naval Academy (Annapolis, 1915); and "Professional Notes," in the *Proceedings of the United States Naval Institute* (ib., bimonthly); and the publications of the United States Signal Office and the Office of the Coast Artillery. See BALLISTICS; GUNNERY.

RANGELEY (rānj′lĭ) **LAKES.** A chain of lakes near the west boundary of Maine (Map: Maine, B 4). The principal members are Kennebago, Rangeley, Mooselookmeguntic, Molechunkemunk, Richardson, and Umbagog. All of these are connected by streams in the order named and form the sources of the Androscoggin River. They lie in a wild and beautiful region and are a favorite resort of tourists and sportsmen.

RANGER, rān′jẽr, HENRY WARD (1858–1916). An American landscape painter, born in western New York. He was self-taught in art, and by travels in France, England, and Holland assimilated various styles of landscape painting. His early work often lacks truth to nature, but he steadily developed in technical skill, breadth, and feeling until finally he became known as the dean of American landscape painters and as a leader of the Tonal school. His favorite subjects are the woods and hillsides of New England. Among his finest paintings are "High Bridge" and "Spring Woods," Metropolitan Museum, New York; "Sheep Pasture," Pennsylvania Academy; "Top of the Hill," Corcoran Gallery, Washington; "Bradbury's Mill Pond, No. 2," and three other landscapes in the National Gallery, Washington. He is also represented in the Carnegie Institute, Pittsburgh, the Buffalo Academy, and the Brooklyn Museum. He received gold medals at Charleston (1902) and Philadelphia (1907) and was elected National Academician in 1906.

RANGERS, MOUNTED. In 1832 the United States government found it necessary to increase the regular-army establishment, owing to increasing Indian troubles and particularly because of the Black Hawk War of that year. One battalion of mounted rangers was raised and added to the establishment, but was disbanded the following year and a regiment of dragoons substituted, which afterward was organized into what is now the First Regiment of regular cavalry. The State of Texas maintains a small body of mounted military police, called Rangers, or the Texas Rangers, whose principal duties consist in enforcing the State laws along the Mexican border.

RANGOON, rȧn-gōōn′, or **RANGUN**. The capital and chief port of Burma, India, on the Rangoon River, the eastern branch of the Irrawaddy, about 25 miles from the sea (Map: Burma, C 3). Rangoon is finely situated for internal as well as foreign commerce, having a continuous water communication with the vast region on the Irrawaddy. The town, well laid out with straight streets crossing at right angles, extends for over a mile along the river front and three-quarters of a mile inland. Rangoon is a stronghold of Buddhism and on every side are seen monuments to Gautama. The most remarkable of these is the Shoay, or Shwe, Dagon Pagoda, a shrine the foundation of which is said to have been laid 588 years B.C. It stands on an artificial elevation 168 feet high within the military cantonment on the north, is 370 feet high, 1355 feet in circumference, entirely covered with gold leaf, and contains personal relics of Buddha; it is annually visited by thousands of pilgrims. The European buildings include the Government House, the courthouses, post and telegraph offices, a cathedral, college, museum, free library, and hospital. Other notable features are the native bazars, Dalhousie and Victoria parks, and the several pretty lakes in the vicinity. Street railways give access to all the principal points. The chief industrial establishments are the lumber, rice, and oil mills; there are also manufactures of silk and cottons, mats, pottery, salts, and fish paste. The river front is lined with wharves, and two-thirds in value of the exports of Burma are shipped and almost all the imports are received at this port, which is the third in importance in British India. The principal exports are teak and rice; the imports include cotton, cutlery, petroleum, hardware, liquors, wines, silks and woolens, and raw silk. The city was rebuilt by Alompra in 1755; the British captured it in 1824, but it was retaken by the Burmese. The British again took possession in 1852, since which time the city has been held by them. Pop., 1901, 234,881; 1911, 293,316.

RANIERI, rȧ-nyā′rė, Antonio (1809–88). An Italian author, born in Naples. He was the friend and biographer of Leopardi, whom he faithfully nursed until his death. His novel, *Ginevra* (1839), and his history, *I primi cinque secoli della storia d'Italia* (1841), involved him in trouble with the government, but United Italy recognized his abilities, and at the time of his death he was a deputy and a professor at the University of Naples. His collected writings were published at Naples in 1862–64 and *Scritti varii* in 1891.

RANJIT SINGH, rŭn-jēt′ sĭng′h′ (1780–1839). Maharajah of the Punjab. He was born at Gujranwala, the son of Maha Singh, Sirdar of Sukur-Chukeah, who died when Ranjit Singh was about 12 years old. When he was about 17 years old his mother died under somewhat suspicious circumstances, and he immediately assumed the reins of government. In 1798, having rendered important service as an ally to Zaman Shah of Afghanistan, who had invaded the Punjab, he received Lahore, which he defended against the neighboring sirdars. To them he next turned his attention and succeeded in subduing some and rendering others tributary. His successes alarmed the Sikh chiefs, allies of the British, situated between the Sutlej and the Jumna, who besought the interference of Lord Minto, the Governor-General. According to a treaty made with Ranjit Singh in 1809 by Charles Metcalfe, the English gave up all interference north of the Sutlej, on condition that that boundary should be respected. Ranjit Singh, thus freed from the only danger he feared, by 1812 had compelled all but three of the Punjab sirdars to resign their authority and proclaimed himself Rajah. In 1813 he obtained possession of Attock, took Multan by storm in 1817, and in 1819 annexed Kashmir, assuming after these exploits the title of Maharajah. In 1822 he took into his service Allard and Ventura, two French officers who had served under Napoleon, and by their aid he finished the reconstruction of his army, with the view of extending his dominion to the west of the Indus. In pursuance of this scheme he wrested the Province of Peshawar from the Afghans in 1829. After several years of desultory war with the Afghans his army was routed by them in 1836, but this reverse does not seem to have affected the stability of his rule, even in the most recently acquired districts, and his reign was not disturbed by a single revolt. He died June 27, 1839. He was totally uneducated, but his administration was energetic and, for an Oriental despotism, equitable. Consult: Griffin, *Ranjit-Singh* (Oxford, 1892); Gen. Sir John Gordon, *The Sikhs* (London, 1904); James Burgess, *The Chronology of Modern India, 1494–1894* (Edinburgh, 1913).

RANK, ränk, Joseph (1816–96). An Austrian novelist, born at Friedrichsthal. He studied law and philosophy in Vienna, but devoted himself entirely to literature and won reputation with the popular tales *Aus dem Böhmerwalde* (1843), a new series of which, *Neue Geschichten aus dem Böhmerwalde*, was published in 1847. These and his other village stories rank among the best of their kind in German literature. Elected a member of the Frankfort Parliament in 1848, he sided with the moderate liberals, lived subsequently at Stuttgart, Frankfort, Weimar, and Nuremberg, and in 1861 became secretary of the Imperial Theatre at Vienna, being afterward appointed to a similar position at the Imperial Opera. His numerous novels and tales include: *Florian* (1853; 3d ed., 1861); *Geschichten armer Leute* (1853); *Von Haus zu Haus* (1853); *Achtspännig* (1856); *Aus Dorf und Stadt* (1860); *Ein Dorfbrutus* (1861); *Im Klosterhof* (1875); *Der Seelenfänger* (1885). Posthumously appeared *Erinnerungen aus meinem Leben* (Vienna, 1896). Consult Pröll, *Joseph Rank* (Prague, 1892).

RANK AND COMMAND. Military rank is that character or quality bestowed on military persons which marks their station and confers eligibility to exercise command or authority in the military service within the limits prescribed by law. It is divided into degrees or grades, which mark the relative positions and powers of the different classes of persons possessing it. In the United States army rank is generally held by virtue of office in an arm of the service, corps, or department, but may be conferred independently of office, as in the case of retired officers and of those holding it by brevet (q.v.). Command is exercised by virtue of office and the special assignment of officers holding military rank who are eligible by law to exercise command. Without orders from competent authority an officer cannot put himself on duty by virtue of his commission alone, except as contemplated in the twenty-fourth and one hundred and twenty-second articles of war. An officer of engineers not on duty with engineer troops, or of ordnance, or of the Adjutant General's, Inspector General's, Judge-Advocate-General's Department, Quartermaster or signal corps, or of the line, detailed to fill a vacancy in these staff departments or corps, though eligible to command according to his rank, shall not assume command of troops unless put on duty under orders which specially so direct, by authority of the President. An officer of the Medical Department cannot exercise command except in his own department.

The rank is relative to the grade or command, and an officer may be of the same grade yet be inferior in rank to another. Officers of the same grade are senior or junior to each other according to the priority of their commission. In the United States the regular-army commission takes precedence of either organized militia or volunteer commissions of the same grade. Where the grade and date of commission of two or more officers are the same, seniority is according to length of previous service; and should their period of service be equal, precedence will be determined (1) by rank in service when appointed, (2) by former rank in the army or marine corps, (3) by lot. Brevet rank applies only to the army.

As responsibility and subordination are the basis of organization, rank and command are the necessary correlatives. Every rank should have its proper command, and conversely every command should be accompanied by a proper rank. The only safe guide is the custom of nations, according to which all the forces of the land, comprising usually several armies, are commanded by a general in chief, who is often the sovereign or head of the nation himself, if he should be by education and training a soldier capable of taking the field in that capacity; each separate army is commanded by a general or field marshal, each army corps by a lieutenant general, each division by a major general, and each brigade by a brigadier general. The regiment is commanded by a colonel, assisted by a lieutenant colonel, each battalion by a major, and each company by a captain, assisted by first and second lieutenants. The relative rank between officers of the United States army and navy is as follows, lineal rank only being considered: general with admiral; lieutenant general with vice admiral; major general with rear admiral; brigadier general with commodore; colonel with captain; lieutenant colonel with commander; major with lieutenant commander; captain with lieutenant; first lieutenant with lieutenant (junior grade); second lieutenant with ensign.

There are some slight differences in the various armies of the world. For example, in France the highest rank is that of marshal of France, and there is no grade corresponding to the United States major general; in Germany the generals are classified as marshal generals, colonel generals, generals of infantry, cavalry, or artillery (commanding army corps), lieutenant generals (commanding divisions), and major generals (commanding brigades); there are no brigadier generals, and there are two grades of captains, first and second class. In Great Britain the battalions are commanded by lieutenant colonels and the field batteries by majors. The grades of noncommissioned officers, other than sergeant and corporal, are also quite different in the different armies.

In the United States by the Constitution the President is the commander in chief of the army and navy, but from time to time the rank of general and lieutenant general has been created or reëstablished by special act of Congress, to be conferred on the commanding general of the army, or latterly the chief of staff, as the position of commanding general was abolished in 1903.

The rank of general has been granted only as a signal honor in recognition of extraordinary services, and those holding it have been as follows:

George Washington......	June 15, 1775, to Dec. 23, 1783
U. S. Grant.............	July 25, 1866, to March 4, 1869
W. T. Sherman..........	March 4, 1869, to Feb. 8, 1884
P. H. Sheridan..........	June 1, 1888, to Aug. 5, 1888

Likewise the rank of lieutenant general has been considered in much the same light, having been held by the following:

George Washington......	July 3, 1798, to Dec. 14, 1799
U. S. Grant.............	March 2, 1864, to July 25, 1866
W. T. Sherman..........	July 25, 1866, to March 4, 1869
P. H. Sheridan..........	March 4, 1869, to June 1, 1888
J. M. Schofield..........	Feb. 8, 1895, to Sept. 29, 1895
N. A. Miles.............	June 6, 1900, to Aug. 8, 1903
S. B. M. Young.........	Aug. 8, 1903, to Jan. 9, 1904
A. R. Chaffee...........	Jan. 9, 1904, to Feb. 1, 1906
John C. Bates...........	Feb. 1, 1906, to April 14, 1906
H. C. Corbin............	April 15, 1906, to Sept. 15, 1906
Arthur McArthur........	Sept. 15, 1906, to June 2, 1909

In addition Gen. Winfield Scott held the rank of brevet lieutenant general from March 29, 1847, to Nov. 1, 1861.

Promotion is an important factor in rank and command, since its rate determines the age at which any particular rank or command is reached, and the latter is a very important element in the organization of an army, because rapid promotion insures to the higher commands young and therefore energetic officers. Germany under peace conditions may be taken as the type of the continental armies, and there promotion from second to first lieutenant normally takes place in the arm of the service, from first lieutenant to captain by corps, from captain to major in the arm again, and above that in the entire army; transfers are often made in order to equalize promotion, and incapable officers are retired; in the general staff promotion is more rapid, because there are more majors than captains, and the former are continually passing out for service in the line. Promotion in the German army previous to the Great War was as follows: to first lieutenant after 7 years of service, to captain after 12, to major after 23, to lieutenant colonel after 30, to colonel after 33, and to major general after 36; in the general staff, however, captaincies are attained in two or three years less than in the line and majorities three or four years earlièr than in the line. See ARMIES; ARMY ORGANIZATION.

RANK, MARKS OF. See MILITARY INSIGNIA.

RANKE, rän′ke, HERMANN (1878–). A German Assyriologist and Egyptologist. He was born at Balgheim, near Nördlingen, was educated at Göttingen, Greifswald, Munich, and Berlin, and from 1902 to 1905 was at the University of Pennsylvania as research fellow in Assyriology and reader in Egyptian. Then, after five years (1905–10) in the Egyptian Museum in Berlin, he became professor of Egyptology at Heidelberg. He brought out the German edition of Breasted's *History of Egypt* (1909) and wrote: *Early Babylonian Personal Names* (1893 et seq.); *Babylonian Legal and Business Documents* (1906); *Aegyptische Texte zum alten Testament* (1909); *Keilschriftliches Material zur altägyptischen Vokalisation* (1910), an important study of cuneiform renderings of Egyptian words and sounds.

RANKE, JOHANNES (1836–). A German physiologist and anthropologist, born at Thurnau, Bavaria. He was educated in Munich, Berlin, and Paris, became a lecturer in physiology at Munich in 1861, in 1869 professor extraordinary, and in 1886 full professor of anthropology, his being the first chair of that science in Germany. In 1889 he became curator and director of the collection of prehistoric objects of Bavaria presented by him to the State. Ranke edited the *Beiträge zur Anthropologie und Urgeschichte Bayerns,* the *Archiv für Anthropologie,* and the *Korrespondenzblatt* of the German Anthropological Society, of which organization he was chosen honorary president. His published works include *Tetanus* (1865); *Grundzüge der Physiologie* (1867–81); *Beiträge zur physischen Anthropologie der Bayern* (vols. i and ii, 1883–92); *Der Mensch* (1887–1902), a very elaborate work on anthropology; *Schädelgrund* (1892); etc.

RANKE, LEOPOLD VON (1795–1886). A celebrated German historian, who, with Niebuhr, was the founder of the modern historical school. He was born at Wiehe in Thuringia. At the age of 18 he went to the University of Leipzig, where he studied theology and the classics. In 1818 he became an instructor in the Gymnasium at Frankfort-on-the-Oder. He first published the *Geschichte der romanischen und germanischen Völker von 1494–1535* (1824). In 1825 he was appointed professor extraordinary at the University of Berlin and entered upon a study of the Venetian Relations. The result of these studies was his *Fürsten und Völker von Südeuropa im 16. und 17. Jahrhundert* (1827). He next received a commission from the Prussian government to go to Venice and investigate the archives there, and in 1834–37 he published *Die römischen Päpste, ihre Kirche und ihr Staat im 16. und 17. Jahrhundert* (10th ed., 1900, under the title *Die römischen Päpste in den letzten vier Jahrhunderten*), a work which attracted the attention of the entire civilized world. In 1834 he was made a full professor at Berlin. Ranke's great studies of the Reformation period in Germany, France, England, and Italy all form parts of one related whole. These works are the most notable and important of Ranke's voluminous contributions to historical literature and form a unique study of the period. Ranke became historiographer of Prussia in 1841. He retired from his chair in Berlin in 1871, but in 1880 began the publication of a universal history. The volumes of the *Weltgeschichte* published before his death carry the account to the eleventh century. Two additional volumes were edited by his assistants after his death. The whole was published in nine volumes (1881–88). Ranke's interests were cosmopolitan, not German, as he lived before the days of intense German nationalism. As a writer he is clear but dry and uninteresting. His fame rests mainly on his scientific method of studying history from original sources and not from legend and tradition. Among his works are: *Die serbische Revolution* (1829), republished as *Serbien und die Türkei im 19. Jahrhundert* (1879); *Die Verschwörung gegen Venedig 1618* (1831); *Deutsche Geschichte im Zeitalter der Reformation* (1839–47); *Französische Geschichte vornehmlich im 16. und 17. Jahrhundert* (1852–61); *Englische Geschichte im 16. und 17. Jahrhundert* (1859–67); *Zur deutschen Geschichte vom Religionsfrieden bis zum dreissigjährigen Kriege* (1868); *Geschichte Wallensteins* (1869); *Zur Geschichte Deutschlands und Frankreichs im 19. Jahrhundert* (1887). His works are published in 54 volumes, covering the range of modern European history. Some of them have been translated into English.

Bibliography. His autobiography, *Zur eigenen Lebensgeschichte,* edited by Alfred Dove (Leipzig, 1890), also published as vols. liii–liv of the collected works; H. B. Adams and others, in American Historical Association, *Papers,* vol. iii (Washington, 1888); E. G. Bourne, in American Historical Association, *Annual Report* (ib., 1896); Alfred Dove, *Ausgewählte schriftchen vornehmlich historischen Inhalts* (Leipzig, 1898); Antoine Guilland, *L'Allemagne nouvelle et ses historiens, Niebuhr, Ranke, Mommsen, Sybel, Treitschke* (Paris, 1899); Wahan Malbandian, *Leopold von Ranke: Bildungsjahre und Geschichtsauffassung* (Leipzig, 1901); H. F. Helmolt, *Ranke Bibliographie* (ib., 1910).

RANKIN, răn′kĭn. A borough in Allegheny Co., Pa., 8 miles from Pittsburgh, on the Baltimore and Ohio, the Pittsburgh and Lake Erie, the Union, and the Bessemer and Lake Erie railroads and on the Monongahela River. It has extensive manufactories of steel and wire goods. Pop., 1900, 3775; 1910, 6042.

RANKIN, (ARTHUR) MCKEE (1841–1914). An American actor, born in Canada. He first played at Rochester, N. Y., under the stage name of George Henley, but after the early sixties appeared under his own name in London, New York, and Boston. Joining A. M. Palmer's stock company, he became one of the best-known American actors, and was especially successful in *The Two Orphans* and in his dramatization of Joaquin Miller's novel, *The First Families of the Sierras,* as *The Danites.* In 1883 he built Rankin's Theatre in New York City.

RANKINE, răn′kĭn, WILLIAM JOHN MACQUORN (1820–72). A Scottish engineer and physicist. He was born at Edinburgh and studied at the university of that city. He afterwards studied civil engineering and was employed on various railways in Scotland as a civil engineer. In 1849 he was elected a fellow of the Royal Society of Edinburgh and in this year read his celebrated paper *On a Formula for Circulating the Expansion of Liquids by Heat.* He published in the *Philosophical Magazine* (1851) a paper on the *Centrifugal Theory of Elasticity as Applied to Gases and Vapors,* in which this theory was elaborated. In 1853 he was elected fellow of the Royal Society and submitted to that body a paper on thermodynamics, *On the Geometrical Representation of the Expansive Action of Heat.* After delivering lectures in the university at Glasgow, he was elected regius professor of civil engineering in that institution in 1855, succeeding Prof. Lewis Gordon. Rankine may be considered one of the founders of the science of thermodynamics (q.v.). In applied science his work as an engineer was of a high order, and he was the first president of the Institute of Engineers in Scotland. He was also consulting engineer to the government and corporations and was a contributor to the *Engineer.* He was the author of the following books: *Manual of Applied Mechanics* (1858); *Manuals of the Steam Engine and Other Prime Movers* (1859); *Manual of Civil Engineering* (1862); *Manual of Machinery and Mill Work* (1869); *Cyclopœdia of Machine and Hand Tools* (1869). Rankine was also the corresponding and general editor of *Shipbuilding Theoretical and Practical* (1866). His *Miscellaneous and Scientific Papers* were published in 1880 and contain a biographical memoir by Prof. P. G. Tait.

RANN OF CUTCH, or **KATCH.** See Cutch, Gulf of; Indus.

RANS'DELL, Joseph Eugene (1858–). An American legislator, born at Alexandria, La. Graduating from Union College (later University), Schenectady, N. Y., in 1882, he practiced law at Lake Providence, La., until 1899, serving also as district attorney of the eighth judicial district (1884–96) and as a member of the levee board of the fifth Louisiana levee district (1896–99). A Democrat in politics, he served in the national House of Representatives from 1899 to 1913 and in 1912 was elected Senator. In the Senate, in 1913, Ransdell bitterly opposed the sugar schedule of the Underwood-Simmons Tariff Bill. President of the National Rivers and Harbor Congress after 1907, he actively promoted legislation for waterways. He became honorary chancellor of Union University.

RAN'SOM (OF., Fr. *rançon,* from Lat. *redemptio,* redemption, ransom, from *redimere,* to buy back, redeem, from *red-, re-,* back again, anew + *emere,* to buy). A price paid by a prisoner of war, or paid on his behalf, in consideration of his being granted liberty to return to his own country. In early times, when armies received little or no regular pay, the soldier looked for his reward in the booty he might capture, and this booty included the bodies as well as the chattels of the vanquished. The conqueror had the option of slaying his prisoner; but for his profit he might make him his slave or sell him into slavery. The transition to accepting compensation from the prisoner himself and setting him at liberty would be natural. In the feudal period in western Europe, when the practice of holding captured kings and other great men to ransom was common, an assessment of freehold tenants for the purpose of ransoming the lord's body from captivity was one of the usual aids or incidents of feudal tenure. See Aid; Feudalism.

In international law the term "ransom" is also sometimes employed to describe a sum paid to redeem captured property, such as ships and the like. For example, a ship captured by a privateer may be redeemed by her owners at an agreed price, and is then entitled to a ransom bill from her captors, i.e., an instrument which is supposed to assure her safe-conduct to her native ports provided she follows a prescribed course.

RANSOM, Matthew Whitaker (1826–1904). An American Confederate soldier and legislator. A brother of Robert Ransom, he was born in Warren Co., N. C. He graduated at the University of North Carolina in 1847 and was admitted to the bar in the same year. He was a Whig in politics and served as Attorney-General of the State (1852–55), and as a member of the Legislature (1858–60), and in 1861 was a peace commissioner to the Confederate Congress at Montgomery, Ala. After his State seceded he soon became colonel of the Thirty-fifth Regiment, was in the Seven Days' battles, and was twice wounded at Malvern Hill. At Antietam he was in command of the brigade during part of the engagement. After Fredericksburg he served in North Carolina, was promoted brigadier general, and during the Gettysburg campaign was in command of the Suffolk line and checked the advance towards Weldon in July. Afterward he served before Petersburg and on the Crater line, was particularly complimented by General Lee for the assault on Hare's Hill (March 25, 1865), and was engaged at Five Forks. From 1872 to 1895 he was a prominent Democratic member of the United States Senate.

RANSOM, Robert (1828–93). An American Confederate soldier, born in Warren Co., N. C., brother of Matthew W. Ransom. He graduated in 1850 at West Point, where he was assistant instructor in cavalry tactics in 1854–55. Later he served in Kansas and on recruiting or frontier duty (1855–61), and was made a cavalry captain in 1861. The same year he resigned his commission to enter the Confederate service. He was then commissioned captain of cavalry, organized the First North Carolina Cavalry, and was chosen colonel. In November he commanded at Vienna, Va., in the first cavalry encounter of the war. On March 6, 1862, he was made brigadier general to reorganize the cavalry in the West and Southwest, but after the fall of Newbern was sent to oppose the Federal forces in eastern North Carolina. During the Seven Days' battles in June–July, 1862, he was attached to Huger's division. In the Maryland campaign, in Walker's division, Longstreet's corps, he took part in the reduction of Harper's Ferry, and was especially commended for judgment and skill at Antietam. At Fredericksburg he commanded the division and had immediate charge of the defense of Marye's Heights. Until May, 1863, he was in charge of the defense of the Weldon Railroad, but on his promotion to be major general was assigned to the district including Appomattox and Blackwater. In October, 1863, he was in command in east Tennessee and southwest Virginia and remained until April, 1864, when he was recalled for the defense of Richmond. He surrendered to General Howard at Warrenton (May 2, 1865). For a time he served as express agent and city marshal at Wilmington, N. C., and then engaged in farming until 1878. In that year he was appointed superintendent of the United States harbor and river improvements about Newbern.

RANSOM, Thomas Edward Greenfield (1834–64). An American soldier. He was born in Norwich, Vt., studied at Norwich University, and at the outbreak of the Civil War entered the

Federal service and was elected major of the Eleventh Illinois Volunteers. Promoted to be lieutenant colonel, he took part in the attacks on Forts Henry and Donelson and distinguished himself at Shiloh. He served on the staff of General Grant, was promoted brigadier general, fought at Vicksburg, and commanded a division in the Red River campaign. He subsequently commanded the Seventeenth Corps in the operations about Atlanta, and was promoted major general. Consult J. G. Wilson, *Sketches of Illinois Officers* (New York, 1862).

RANSOME, Frederick Leslie (1868–). An American geologist, born at Greenwich, England. He was educated at the University of California (S.B., 1893; Ph.D., 1896) and was an assistant in mineralogy and petrography at Harvard in 1896–97. Assistant geologist (1897–1900) and thereafter geologist on the United States Geological Survey, he had charge of the sections of western areal geology and of metalliferous deposits after 1912. At the University of Chicago he lectured on ore deposits in 1907. Ransome became associate editor of *Economic Geology* and of the *Journal* of the Washington Academy of Sciences. His many official reports and bulletins deal mainly with phases of economic geology.

RANT′ERS. An alleged English sect of the Commonwealth period of Antinomian views. They were charged with immoral practices and were speedily suppressed. Thomas Fuller, in his *Church History,* associates them with the Familists. Probably many of the stories about them were idle gossip. The Primitive Methodists were also called Ranters because of the violent physical phenomena which attended their worship.

RANTOUL, răn′tōōl, Robert, Jr. (1805–52). An American lawyer and political leader. He was born in Beverly, Mass., graduated at Harvard in 1826, and early practiced law at Gloucester. He became a leading supporter of Andrew Jackson, and from 1834 to 1838 was a member of the State Legislature. He was a member of the first commission to revise the laws of Massachusetts and in 1837 was appointed by Gov. Edward Everett a member of the first State Board of Education. In 1839 he removed to Boston, where his connection with several legal cases of great importance added to his growing reputation. In 1843 he was appointed collector of the port of Boston and from 1845 to 1849 was United States district attorney. In 1852 he defended Thomas Sims, the first slave reclaimed under the Fugitive Slave Act from New England. In 1851 he was elected to the United States Senate to fill out the term of Daniel Webster and in November of the same year was elected to Congress as the candidate of Democrats and Free Soilers. His strong opposition to the Fugitive Slave Law and to the general proslavery policy of the Democratic party led to his exclusion from the Convention of 1852 that nominated Franklin Pierce for the presidency.

RAN′ULA (Lat., little frog; so called from a fancied resemblance to a frog in the form of the swelling). A cystic tumor on the floor of the mouth caused by obstruction and dilatation of one of the several ducts of the salivary glands or mucous follicles, opening under the tongue. The tumor contains a glairy fluid, resembling mucus or saliva, which, as it increases in size, pushes the tongue to the opposite side. Ranula is not painful, and these tumors sometimes reach a considerable size before relief is sought. The usual method of treatment is by free incision or by removing a portion of the sac wall; if this is not effective and the sac refills, the interior is touched with a caustic such as nitrate of silver or pure carbolic acid, to produce an adhesive inflammation of its walls.

RANUN′CULA′CEÆ (Neo-Lat. nom. pl., from Lat. *ranunculus,* sort of medicinal plant, dim. of *rana,* frog), Crowfoot Family. A family of about 35 genera and 11,000 species of dicotyledonous herbs (rarely climbing shrubs), distributed throughout the world, but not abundant in the tropics. The family is quite variable in its features, but is characterized in general by hypogynous flowers, with five sepals and petals, and numerous stamens and carpels. It is regarded as the genetic family characterizing the order Ranales and giving rise to the higher dicotyledons, as well as to the monocotyledons. It includes many very familiar forms, such as buttercup, larkspur, anemone, columbine (*Aquilegia*), clematis, marsh marigold, peony, etc.

RANUN′CULUS. A genus of about 275 species of mostly perennial herbs of the family Ranunculaceæ (q.v.), some of them (crowfoots, buttercups, pilewort or lesser celandine) common in pastures and gardens, many (spearworts) in moist places, others wholly aquatic. See Plate of Dicotyledons.

RANZ DES VACHES, räɴs dȧ vȧsh (Swiss Fr., lowing of the cows, or line of the cows). A name applied to certain simple native melodies of the Swiss Alps, which are usually sung by the herdsmen and played by them, when driving their herds to and from the pasture, on the alpenhorn (q.v.). It is a peculiarity of this music that it is seldom in tune, owing to the presence of the eleventh overtone (a tone between f^2 and $f^2\sharp$) on the alpenhorn. Its principal characteristics are rising and falling broken chords, repetitions, and (when sung) the use of the jodler. A collection of ranz des vaches, along with other Swiss melodies (*Sammlung von Schweizer Kuhreigen und Volksliedern*), was published at Berne in 1818, and these airs are also to be found in the *Allgemeines Schweizer Liederbuch* (1851). The ranz des vaches of Switzerland are ruder in their character than the mountain melodies of the Tirol, with which they are sometimes confounded. See Kuhreigen.

RAOULT, rȧ′ōōl′, François Marie (1830–1901). A French chemist, born at Fournes-en-Veppes, Nord, and educated in Paris, where he became doctor of physical science in 1862. He became professor of chemistry (1870) and then (1889) dean of the faculty of science in the University of Grenoble. His earlier studies were in electrochemistry, but he is better known for his work on the freezing point and boiling point of solutions. About 1884 he discovered the general law of the freezing of solutions, demonstrating that the depression of the freezing point of a liquid, caused by dissolving in it equal quantities of substances, is inversely proportional to the molecular weights of the latter. In 1886 he produced experimental evidence showing that a similar law holds good for the vapor pressure (and hence the boiling point) of solutions. The immediate practical value of Raoult's laws lies in the fact that they permit of determining the molecular weight of innumerable substances that are nonvolatile, but that are soluble in some liquid. See Boiling Point; Dissociation; Freezing Point; Molecules—Molecular Weights.

RAPACES, rȧ-pā′sēz. See Bird of Prey.

RAPALLO, rȧ-päl′lō. A winter resort in the Province of Genoa, Italy, situated on the Gulf of Genoa, 16 miles by rail east by south of Genoa (Map: Italy, B 2). It has manufactures of lace and olive oil, and fisheries of coral and tunny. Pop. (commune), 1901, 10,765; 1911, 12,051.

RAPE (from ME., MLG. *rapen*, to seize, snatch, Ger. *raffen*, to snatch, Eng. *rap*, to carry away, seize, confused with the unrelated Lat. *rapere*, to seize). The crime of having carnal intercourse with a woman against her consent and by force. The essence of the offense is that force be used, and it is immaterial what is the age of the woman and whether she is married or single, chaste or unchaste. The only difference caused by the habitual unchastity of the woman is that in such a case it is less easy to satisfy the jury that the element of consent was wanting. With regard to an idiot woman or an infant of tender years, it is not necessary to prove resistance on her part to establish the crime. If consent be extorted by fear and threats, or where several men join together, and resistance is useless, this is the same as using violence to overpower the woman. Where the woman is stupefied by drink so that the power of resistance is annihilated, it is the same as knocking her down. In case force is used in the first instance, but the woman afterward consents, the crime of rape will not be committed, though the evidence may be sufficient to establish the crime of assault. At the common law a girl under the age of 10 was presumed to be incapable of consenting to sexual intercourse, and the act performed on such a child was rape, irrespective of her actual consent. By modern statutes the "age of consent" has been raised generally to 12, 14, 16, or even 18 years in England and the United States. See Age; Consent.

One of the important circumstances attending the crime of rape is the mode of proof, and in this respect it differs from other crimes. It is held to be all but essential, as a corroboration of the woman's story, that if her cries of resistance were not heard, at all events she should have, immediately after the offense, complained on the first opportunity to her friends or relatives. It is not allowed to give in evidence the particulars of such complaint, but merely the fact that she made a complaint against some person. Unless this important particular be proved, her evidence is looked upon with great suspicion and may be discredited by the jury. One of the common defenses to a charge of rape is the unchastity of the woman, the object being to render it unlikely that she did not consent, and hence it is in practice considered a proper question for the prisoner's counsel to put to her whether she had not had connection with the prisoner before or with other men, but at the same time she is cautioned by the judge that she is not bound to answer such questions unless she likes. If, however, she denies the accusation, witnesses may be called to contradict her on that point.

At common law a boy under 14 years of age was presumed incapable of the crime of rape. By statute in many of the United States this presumption may be rebutted by evidence. Consult: Clark and Marshall, *A Treatise on the Law of Crimes* (2d ed., St. Paul, 1905); J. W. May, *The Law of Crimes* (3d ed., Boston, 1908); W. O. Russell, *A Treatise on Crimes and Misdemeanors* (7th ed., 3 vols., London, 1909).

RAPE. A division of the county of Sussex, England. See Shire.

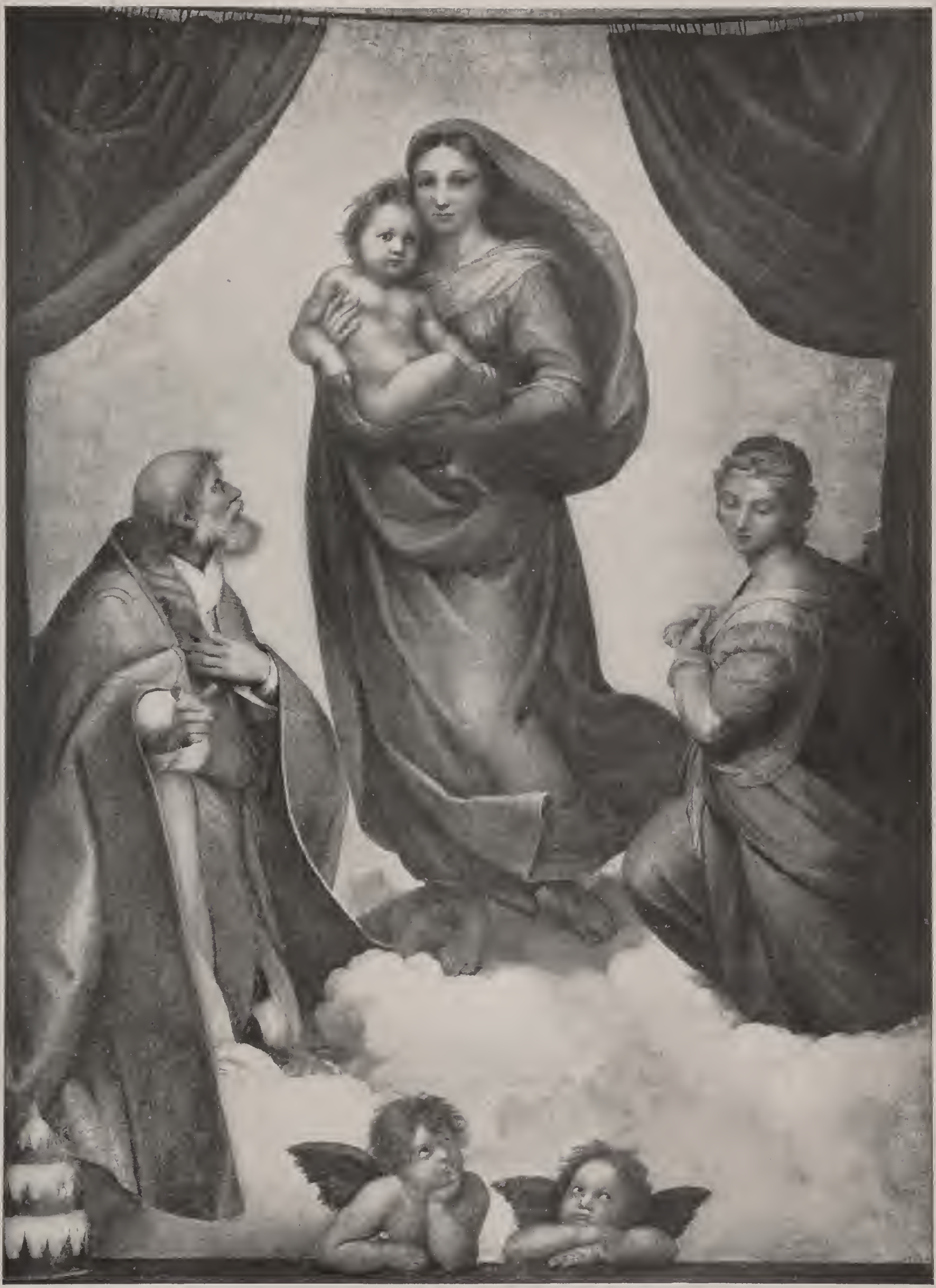
RAPE (from Lat. *rapa, rapum*, Gk. ῥάπυς, *rhapys*, ῥάφυς, *rhaphys*, turnip), *Brassica campestris*. A European and Asiatic herb of the family Cruciferæ, resembling a turnip in general growth, but with a spindle-shaped root. It is widely grown in Europe for the oil expressed from its seed (coleseed) and for its foliage, which is an important stock food. In America the latter is its only use. The very leafy plant grows from 1 to 3 feet tall and is cultivated either broadcast or in drills like turnips in deep, rich, well-drained friable soil and in cool climates. It is a valuable green manure, since it effectively smothers weeds. It is especially esteemed as a food for sheep and hogs. For dairy cattle it is less useful since, unless fed with caution, it may unpleasantly flavor the milk.

RAPE OF EUROPA. See Europa, Rape of.

RAPE OF LUCRECE, The. 1. A poem by Shakespeare (1594), founded on the story of Lucretia and Tarquinius Sextus. 2. A drama by Thomas Heywood (1630).

RAPE OF THE LOCK, The. A mock-heroic poem by Alexander Pope (1712), enlarged in 1714, written to smooth over a quarrel caused by young Lord Petre's cutting off a lock of Miss Arabella Fermor's hair.

RAPHAEL, rä′fȧ-ĕl (1483–1520). One of the greatest painters of the Italian Renaissance and of all times. The modern Italian form of the name is Raffaello, and his family name Santi is also written Sanzio. He was born at Urbino on Good Friday (March 28), 1483, according to Vasari, but according to the more reliable inscription upon his tomb by Cardinal Bembo, on April 6. His father, Giovanni Santi (q.v.), was a painter of some merit and a poet, and his mother, Magia, was the daughter of Battista Ciarla, a merchant of Urbino. Of Raphael's youth almost nothing is known. His mother died in 1491, and he came under the care of a young stepmother, against whom he appeared in a lawsuit after his father's death in 1494. He probably received a good education and grew up in the refined and artistic atmosphere of the court of Urbino. Like his father, he stood in high favor with Duke Guidobaldo and his wife, and especially with Giovanna delle Rovere, the Duke's sister. He inherited from his father a genial eclecticism and was perhaps influenced by his father's associate, Evangelista di Piandemeleto, but his real instruction began with another master. According to the former view, based upon Vasari, this was Perugino at Perugia, but Perugino's movements before 1499 render this view extremely unlikely. Morelli has shown that Raphael's earliest works resemble those of Timoteo Viti (q.v.), an Umbrian painter, who was a disciple of Francia at Bologna and resided at Urbino between 1495 and 1500, of whom we also know that he was a friend of Raphael. As Perugino did not return to Perugia until 1499–1500, it was probably then that Raphael became his assistant. He followed his master so closely that their works of this period are very difficult to distinguish. He was also much influenced by Pinturicchio, though it is doubtful whether he assisted him, as Vasari states, in the frescoes of the cathedral of Siena. Very important for this early period is the so-called Raphael's "Sketch Book" in the Academy of Venice, a collection of drawings by various Umbrian masters, which Morelli has shown are mainly by Pinturicchio, though a few are probably by Raphael after his designs.



RAPHAEL
"SISTINE MADONNA," FROM THE PAINTING IN THE ROYAL GALLERY, DRESDEN

All the works of Raphael up to the time of his removal to Florence in 1504 belong to his Umbrian period. The earliest, according to Morelli, is a small but consummate "St. Michael" in the Louvre, which also possesses "Apollo and Marsyas" and "St. George and the Dragon" of the same period. Best known of all is the charming "The Knight's Dream" (National Gallery, London), an allegory, resembling the mythical vision of Hercules. These works closely resemble those of Timoteo Viti, in form and miniature-like execution, as well as in a delightful poetic sentiment. The finest Madonna of this period is the delightful little Connestabile panel at St. Petersburg. For other Madonnas of the Umbrian period, see Madonna.

Raphael's more ambitious works resemble Perugino's, except that with him everything is more refined and harmonious, the composition is better, the execution more careful and powerful. Although Perugino departed from Perugia in 1502, his influence is seen in the design of the "Coronation of the Virgin" (c.1503), now in the Vatican Gallery. He executed three important altarpieces in the neighboring Città di Castello, two of which survive—one, a "Crucifixion," being in the Mond collection, London; the other, the famous "Sposalizio" (Marriage of the Virgin), in the Brera, Milan. The latter was formerly supposed to be a copy of the same subject by Perugino at Caen, but Berenson has lately pronounced the Caen picture a copy of Raphael's picture by Lo Spagna. The most ambitious Madonna of the Umbrian period is the fine example in the Morgan collection (Metropolitan Museum, New York). Morelli has justly assigned to Raphael the realistic portrait of Perugino in the Borghese Gallery, Rome, formerly attributed to Holbein.

Equipped with a letter of introduction from the Duke of Urbino's sister to Soderini, gonfalonier of Florence, Raphael removed to that city in 1504. The opportunities for the development of a young artist were at that time most favorable. Florence was in an artistic ferment over the battle of the giants, Michelangelo and Leonardo, in their rival cartoons for the Palazzo Vecchio (see Michelangelo; Vinci, Leonardo da), and Fra Bartolommeo had just returned to the brush with new designs and ambitions in art. The youthful Raphael studied, in the Brancacci Chapel, the frescoes of Masaccio, whose "Adam and Eve" are recognized in Raphael's Vatican frescoes. He also studied the sculpture of Donatello, as may be seen in his admirable "St. George" (in the Louvre, 1506; replica in the Hermitage, St. Petersburg). From Leonardo he learned modeling and chiaroscuro; from Michelangelo anatomy and dramatic action; from Fra Bartolommeo composition and the art of enlivening statuesque groups by contrasts. His intense diligence is proved by his surviving sketches of Michelangelo's and Leonardo's cartoons and by the innumerable studies for his pictures. Though usually begun with his adoption of a figure or an idea of some other master, his studies end in something quite individual.

Raphael's development during the Florentine period can best be followed in his Madonnas, in which the influence of the various masters is most apparent. Though, like the Florentine, he portrays the simple relation of mother and child, his works are essentially original in pose, in the elimination of the accidental, and in the absolute harmony of all parts both in color and line. The first early example is the "Madonna del Gran Duca" (Pitti Palace), still Umbrian in the draperies and rather resembling Timoteo Viti than Perugino. The transition from fifteenth-century Umbrian to Raphael's own style is seen in the four delightful examples at Berlin, Vienna, Florence, and Paris, in which the Virgin is represented with the infants Christ and John in the midst of a beautiful landscape. All show the influence of Leonardo in sentiment and composition, and the last named, "La Belle Gardinière," in which figures and landscape are perfectly balanced, is one of Raphael's great creations. The last of Raphael's Madonnas executed at Florence, the "Madonna del Baldachino" (Pitti), a monumental altarpiece, shows his close association with Fra Bartolommeo, who completed it. Similar in character with the Madonnas are his less numerous "Holy Families," at Madrid, Munich, and especially the one with the beardless Joseph at St. Petersburg.

Raphael's most important commissions during his stay in Florence came from Umbria. In 1505 he executed for the convent and chapel of San Severo in Perugia the fresco the "Adoration of the Trinity," a well-balanced composition, reminding one somewhat of Bartolommeo's "Last Judgment." For Lady Atalanta Baglione of the ruling family of Perugia he executed the well-known "Entombment" (1507, Borghese Gallery, Rome), an altarpiece in memory of her murdered son. The picture is eclectic in style, showing especially the influence of Michelangelo. To the early part of the Florentine period, still showing Perugino's influence, belongs the beautiful three-quarter figure of "St. Catharine" in the National Gallery, London. Of his portraits the chief are those of Angelo Doni and his wife (1505), the latter recalling Leonardo's "Gioconda"—all in the Pitti Palace—and Raphael's own youthful likeness in the Uffizi. All of these date from the early part of his Florentine period.

From a letter of Raphael dated April 21, 1508, we know that he was then still in Florence, but from another of September 5 that he was at Rome in the service of the Pope. His fellow citizen of Urbino, the architect Bramante, induced Julius II to call him thither. With his accustomed tact in making the best use of artists, the Pope commissioned him to fresco four chambers of the Vatican. They were small, irregularly built, and poorly lighted, but Raphael, aided by the advice and assistance of Bramante, transformed them into spacious halls, with far vistas and beautiful architectural effects. In these decorations the development of his art during the Roman period may best be traced. The first room was the Camera della Segnatura (1509–11), so called from the papal signatures written there. It is by far the best, because executed almost entirely by his own hand. The general plan of the decoration was to represent the four spiritual powers, "Theology," "Philosophy," "Poetry," and "Justice," typified by beautiful female figures occupying medallions in the ceiling of the room. On one of the large walls, under "Theology," is the celebrated "Disputa," in two divisions. Grouped about an altar on the earth below, grave theologians and laymen are discussing the mystery of the Trinity. One of them points upward, where, in the hierarchy of the heavens, the mystery is revealed. While this work is still Florentine in character, the wall under "Philosophy," the "School of Athens," shows a more independent and classic art. The scene is laid in a beautiful architectural hall, in which all the philosophers and wise men of antiquity, grouped about Plato and Aristotle, are discussing the problem of life. Among the philosophers to the right Raphael has introduced his own portrait and that of Sodoma. Upon the irregular wall under "Justice" are three representations typifying civil and canon law. Under "Poetry," esteemed by many the most beautiful female figure which Raphael ever painted, is the celebrated "Parnassus." Surrounded by the Muses, Apollo sits on a mountain which is so painted as not to be disturbed by an intervening window, and in the spaces on either side are the great poets of Greece, Rome, and Italy. From the point of view of architectural decoration this superb room is considered by many to represent the highest possible attainment in the perfect harmonious blending of architectural form and detail with decorative painting.

The second chamber, the Stanza d' Eliodoro (1512–14), represents the triumph of the Church over its temporal foes and over false doctrine. The medallions and the beautiful decorations of the ceiling are after Raphael's designs, but the wall paintings were executed, at least in part, by himself. The composition is somewhat disturbed by the introduction of papal portraits into three of the frescoes, but this is atoned for by the resulting magnificent group of portraits. The "Expulsion of Heliodorus from the Temple," a painting of mighty dramatic power, symbolizes the expulsion of Charles VIII of France from Italy. "Attila and Leo the Great" is a remarkable composition, designed almost entirely of horsemen. The "Mass of Bolsena" shows how the Host was changed into blood under the eyes of an unbelieving priest, and over the other window "Peter's Release from Prison" is remarkable for its portrayal of the gloom of the night, under the triple illumination of the moon, torches, and the apparition of the angel. The paintings of this room, particularly the one last mentioned, are Raphael's most remarkable coloristic production and show the influence of the Venetian Sebastiano del Piombo, who was at that time in Rome. They also show, in the fine dramatic action, a further influence of Michelangelo, probably derived from frescoes in the Sistine Chapel. This is still more evident in the fresco of "Isaiah" (1512; San Agostino) and in those of the "Sibyls" (1514; Santa Maria della Pace), in which Raphael enters the list as a rival of Michelangelo. A third important influence upon Raphael's art was that of the classic monuments of Rome, but he harmonized all of these factors into an individual art of his own.

The third chamber of the Vatican, the Stanza del Incendio (1514–17), is decorated with historical scenes from the lives of Leo III and Leo IV, the best of which, the "Incendio del Borgo," after which the room is named, represents Leo IV miraculously extinguishing a fire at Rome. It contains wonderfully strong figures and fine nudes. Of the fourth chamber, the Sala Constantina, only the designs were furnished by Raphael, and of these only two were used, the principal of which, the "Victory of Constantine over Maxentius," was executed by Giulio Romano. Near by are the decorations, in stucco relief and color, of the Loggie of the Vatican, which, of all his works, show the highest influence of the antique. The adornment is mainly of grotesques, copied after the Roman models lately discovered in the substructions of the baths of Titus, and on the ceiling is the so-called Raphael's Bible, 52 pictures of biblical subjects executed by Giulio Romano.

Before the death of Julius II, in 1513, Raphael assumed an important position at the papal court, and under Leo X his influence increased. Upon the death of Bramante, in 1514, he was made chief architect of St. Peter's, at his dying predecessor's request, and in 1515 he was appointed conservator of all the excavations of antiquities in and near Rome. The greatest statesmen and humanists of the day sought his friendship, and kings requested, as an especial favor, a work by his hand. He attended court with a following of 50 painters and lived like a prince. Under such circumstances it was impossible for him to execute the remaining decorations of the Vatican with his own hand. He was compelled to intrust them and the execution of his architectural and other designs to his numerous pupils. His compositions became grander than ever, but the execution suffered. The celebrated engraver Marcantonio Raimondi (q.v.) was entirely occupied in carrying out his designs for prints.

Perhaps the most powerful decorative work of Raphael's later life is the 10 delicately colored cartoons for the tapestries which hung upon the walls of the Sistine Chapel. The original tapestries are still in the Vatican, and there are copies at Berlin, Dresden, and Madrid, but only seven of the cartoons survive, in South Kensington Museum, all of them showing wonderful technique and power. The best are the "Miraculous Draught of Fishes," "Christ's Charge to Peter," and "Peter and Paul Preaching." For his friend Agostino Chigi he also designed the architecture and decorations of the Chigi Chapel in Santa Maria del Popolo and the beautiful decorations of the Villa Farnesina. Of these the fresco "Galatea" (1514) is perhaps the most perfect of all modern mythological pictures. In it the antique lives again, executed, however, with the more naturalistic technique of the sixteenth century. Raphael's talent as a narrator was never more perfectly exhibited than in the Farnesina with his story of "Cupid and Psyche" (1518–20), which, though executed by his pupils, contains some of the best modern versions of antique mythology. Especially beautiful is the fresco of "Jupiter Kissing Cupid," in which the majesty of old age and the beauty of youth are charmingly contrasted. Unfortunately these decorations have suffered considerably from restorations and partial repaintings.

Along with these greater undertakings Raphael executed numerous easel paintings. His portraits are admirable realistic productions with a strong and unaffected conception of character, belonging, indeed, to the greatest portraiture that has ever been produced. Among the principal examples, besides those wonderful likenesses in his frescoes, is that of "Julius II," surviving in a number of examples, of which the original is probably in the Pitti Palace. The old man is represented as seated in an armchair, engaged in deep meditation. Other celebrated specimens are the portraits of Leo X (1518) with two cardinals, a splendid piece of realism; of Cardinal Bibbiena, of which the original is at Madrid; of Tommaso Inghirami at Volterra; of Baldassare Castiglione, a marvelous piece of color, and Joanna of Aragon, in the Louvre; and the beautiful "Donna Velata," the prototype of the Sistine Madonna, in the Pitti

Palace. The celebrated "Fornarina," formerly supposed to be a portrait of Raphael's beloved, is now attributed to Sebastiano del Piombo (q.v.).

Among his religious pictures the greater number were Madonnas, most of them executed by his pupils. (For an enumeration and description, see MADONNA.) The best example of his early Roman period is the "Madonna della Sedia," or "Seggiola" (Pitti Palace), so called from the chair upon which she is seated. The Virgin is represented as a beautiful Italian woman in picturesque Roman folk costume. The expression of sublime maternal love in this picture has never been excelled. The last and grandest of all of his Madonnas, the consummation and perfection of all such efforts, perfect alike in form, color, and composition, is the "Sistine Madonna" (Dresden Gallery). Painted as an altarpiece for the church of San Sisto at Piacenza, it was finished just before Raphael's death. The Virgin is not represented primarily as a mother, but as the Queen of Heaven descending from the clouds, which are themselves composed of the heads of thousands of cherubs. The Christ-child looks with thoughtful eyes, as if conscious of his destiny as a Saviour of the world, while on either side St. Sixtus and St. Barbara kneel in adoration. At the base of the picture are the two celebrated cherubs.

Raphael's other religious pictures typify the waking religious consciousness of Italy in reply to the Reformation of the North: "Lo Spasimo di Sicilia" (Christ Sinking beneath the Cross) (Madrid); "The Vision of Ezekiel" (Pitti Palace), minute in execution and beautiful in color; the celebrated "St. Cecilia" (1515; Bologna), surrounded by four saints, listening with varied expressions of ecstasy to the heavenly chords; "St. Michel Crushing Satan" (1518; Louvre); "The Transfiguration" (Vatican), left unfinished at Raphael's death and completed by Giulio Romano.

As an architect Raphael was not of the same importance as a painter. He was a disciple of Bramante, whose plan of St. Peter's he continued, though he also had one of his own. (See SAINT PETER'S CHURCH.) The Farnesina is usually ascribed to Peruzzi, and of his other palaces the Palazzo Pandolfini at Florence is the only one carried out in accordance with his plans. His chief work, the Villa Madama, built about 1516 for Cardinal Giulio de' Medici, displays forms of simple majesty. Unfortunately the design was never carried out in its entirety. As a sculptor he is reputed to have carved the "Boy Astride a Dolphin" (St. Petersburg), but the attribution is doubtful. He also tried his hand at poetry, but his few sonnets are amateurish.

Raphael died on Good Friday (April 6), 1520, at the age of 37, as a result of a fever contracted during the excavations in Rome. All Rome mourned over his loss, and he was interred with great honor in the Pantheon. His character, like his art, was a perfect harmony of the elements which go to make life beautiful, and his contemporaries valued the one as highly as the other.

The opinion of Raphael's contemporaries, that his work was the highest perfection of pictorial art, has met with dissent among certain modern artists and critics, who find him lacking in this or that technical quality. But while he did not attain the very highest in all technical qualities, perhaps no other man possessed in such a high degree so many qualities which go to make up the perfect artist. His work embodies the best of all the Central Italian schools, and it is, in this sense, the culmination of Italian painting. To whatever he adopted he added a harmony and grace distinctly his own, attaining more nearly to the universal than any other artist since the Greeks. And in one purely technical quality Raphael has never been surpassed by any artist. In his small pictures as well as in his great frescoes, in arrangement as well as in the treatment of space, his composition is faultless.

The chief cause of Raphael's great popularity with the general public is that he was what Berenson calls "a lovable illustrator." With an imagination that has never been surpassed, he has, better than any other one, embodied our conception of antiquity, translating it into forms surpassing our fairest dreams. He has Hellenized the Hebraic universe, creating, in place of the stern personages of the Old and New Testament, those beautiful ideal types which will last as long as art lasts. In his Madonnas and ideal figures he has created the types of womanhood which "embody for the great number of cultivated men their ideals and spiritual aspirations."

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RAPHAEL, răf′ā-el, WILLIAM (1839–). A Canadian landscape and figure painter. Born and educated in Berlin he studied there in the Royal Academy under Wolf and Begas. He went to Canada in 1860 and settled in Montreal. His best work includes "Bonsecours Market, Montreal, in Summer and Winter" and "Habitants Attacked by Wolves." Raphael was one of the founders and original members of the Royal Canadian Academy of Art (1880). In 1904 he was appointed a member of the Provincial Council of Arts and Manufactures.

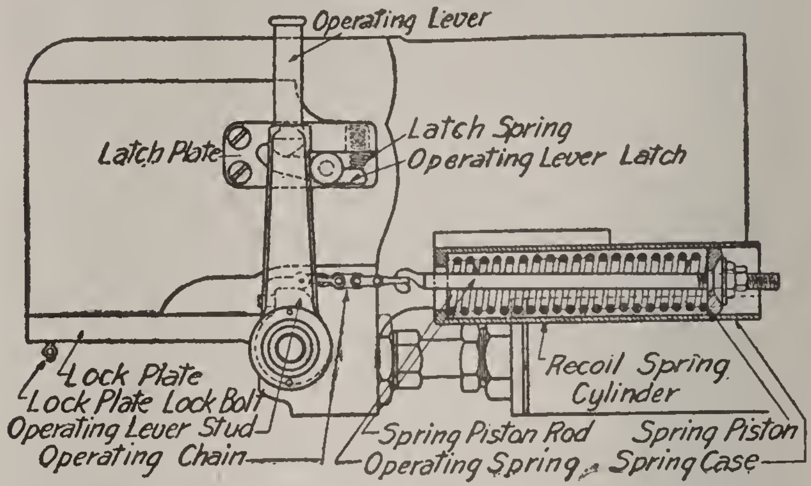
RAPHELENGH, rȧ′fȧ-lĕng′, or **RAPHELING,** FRANCIS (1539–97). A Flemish scholar and printer, born at Lannoy in French Flanders. He studied classical and Oriental languages in Paris and afterward taught Greek at Cambridge. Upon his return to the Netherlands in 1565 he entered the Antwerp printing office of Christopher Plantin, whose daughter he married. Here he did valuable editorial work and supplied original matter for books in the form of notes and prefaces. He also worked on the Polyglot Bible, printed at Antwerp in 1569–72, by order of Philip II of Spain. Afterward he moved to Leyden, where he opened a printing office and accepted the chair of Hebrew and Arabic at the University. He published a Hebrew grammar and Chaldee and Arabic dictionaries, which later had 13 editions. See PLANTIN, CHRISTOPHE; POLYGLOT.

RAPHIDES, răf′ĭ-dēz (Neo-Lat. nom. pl., from Gk. ῥαφίς, *rhaphis*, needle, pin, from ῥάπτειν, *rhaptein*, to sew). Elongated, needle-shaped parallel crystals of calcium oxalate occurring in plants. It has been claimed that they protect plants against herbivorous animals, but investigation shows that no injuries follow the eating of plants containing them. Raphid-bearing cells are found in great quantities in the parenchyma of monocotyledons, such as *Amaryllis*, *Crinum*, *Narcissus*, and *Hyacinthus*.

RAP′IDAN RIVER. A small river of Virginia, tributary of the Rappahannock (q.v.), which it joins 10 miles above Fredericksburg (Map: Virginia, G 3).

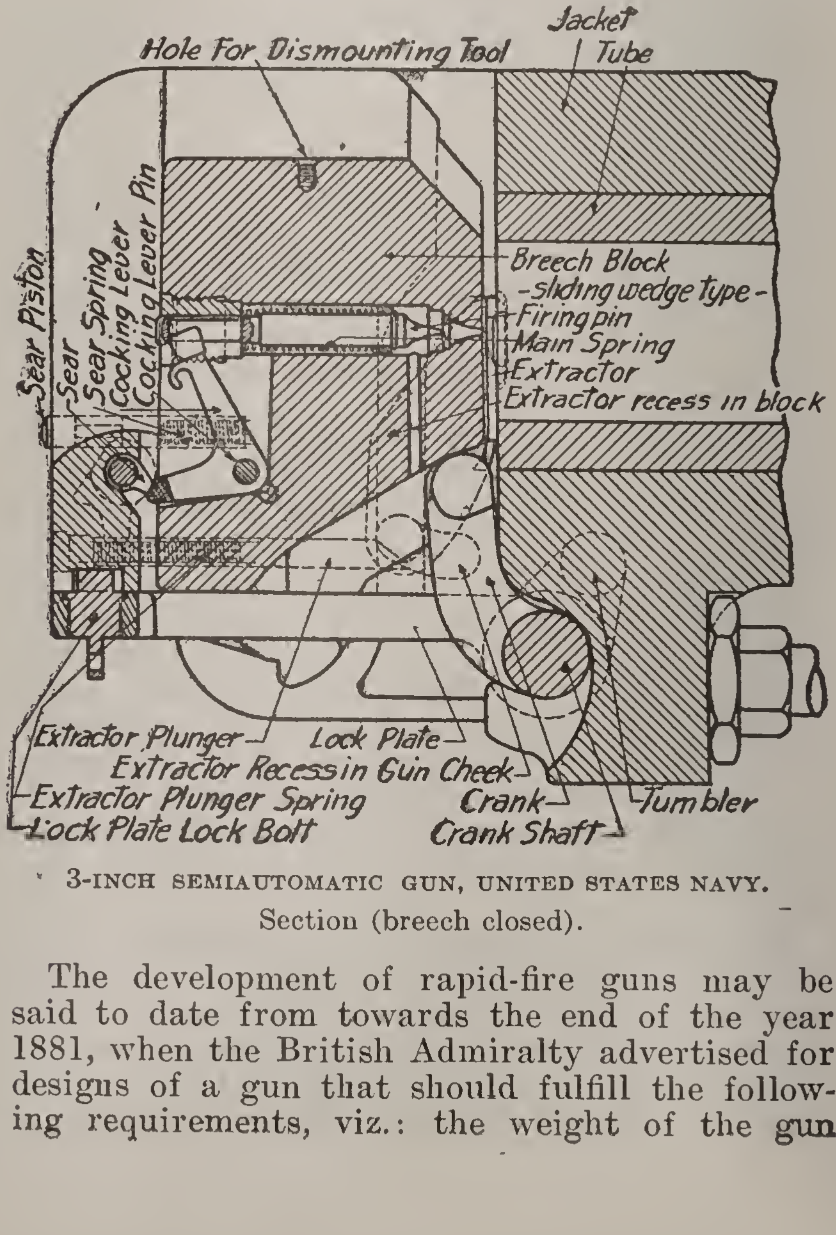
RAPID CITY. A city and the county seat of Pennington Co., S. Dak., 65 miles southeast of Lead, on the Chicago and Northwestern, the Chicago, Milwaukee, and St. Paul, and the Rapid City, Black Hills, and Western railroads (Map: South Dakota, A 3). It contains the State School of Mines, a government Indian school and land office, and a fine Federal building. Rapid City is the gateway to the Black Hills. In the vicinity are extensive deposits of gold, tin, mica, stone, granite, and gypsum, and the city has lumbering and cattle interests, a creamery, cigar and saddle factories, flour and saw mills, etc. The commission form of government was adopted in 1913. Pop., 1900, 1342; 1910, 3854.

RAPID-FIRE GUN. A cannon designed to have a very rapid rate of firing. The term is losing much of its significance owing to the great rapidity with which all guns are now loaded and discharged. It nevertheless continues to be applied to guns of 8 inches or less in calibre in which the loading is effected chiefly by hand.



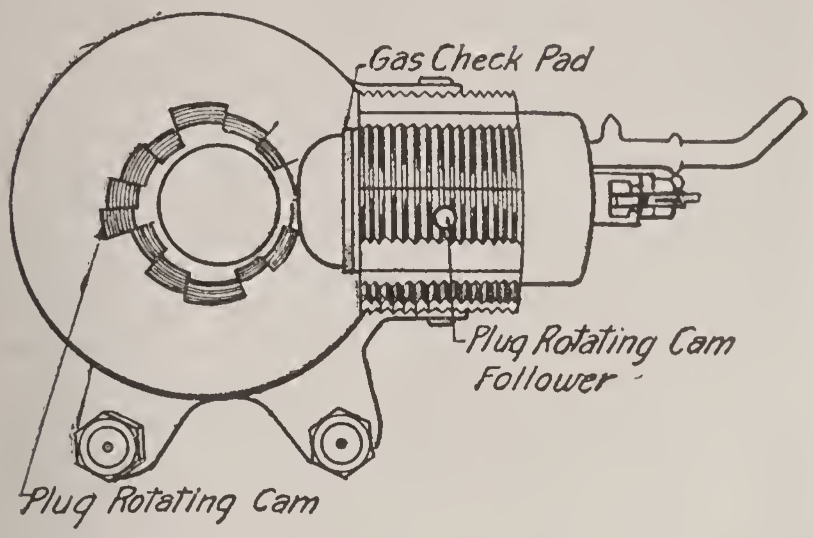
3-INCH SEMIAUTOMATIC GUN, UNITED STATES NAVY.
Side view of breech showing some parts in section.

After the limit of size for machine-gun action had been reached, the advantages of rapid fire to guns of calibres large enough to be effective against torpedo boats was appreciated, and 3-pounders and then 6-pounders were made by Hotchkiss and Nordenfeldt, with one barrel and worked by hand, but with quick-opening mechanism and fixed ammunition. This movement progressed to a remarkable extent between 1890 and 1900, heavier and heavier guns being required as torpedo boats increased in size and protection to their boilers by heavier plating, coal, etc., making the penetration of missiles more difficult.

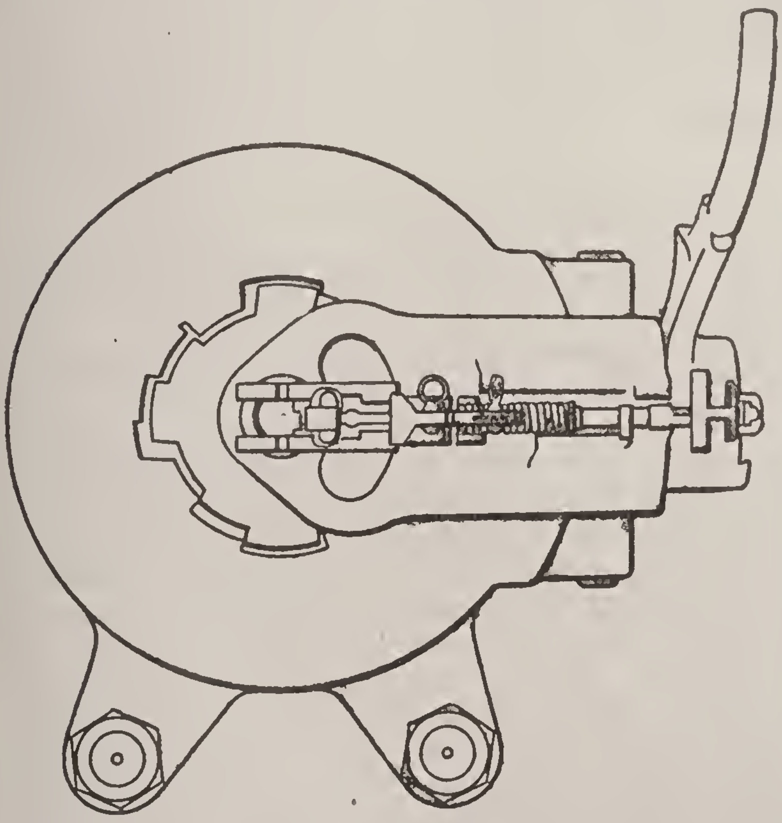


3-INCH SEMIAUTOMATIC GUN, UNITED STATES NAVY.
Section (breech closed).

The development of rapid-fire guns may be said to date from towards the end of the year 1881, when the British Admiralty advertised for designs of a gun that should fulfill the following requirements, viz.: the weight of the gun and mount not to exceed 10 hundredweight (1120 pounds); the projectile to weigh 6 pounds and have a muzzle velocity of not less than 1800 feet per second; the projectile and powder to be made up in one cartridge; the service of the gun to require not more than three men; under the above-mentioned conditions the gun to be capable of firing at least 12 aimed shots per minute. About the same time the French Department of Marine invited designs for a three-pounder to fulfill relatively the same conditions. These two advertisements resulted in the production of the rapid-fire gun. Mr. Hotchkiss, an American who had established works in France, brought out a series of guns, one, three, and six pounders, and it is perhaps interesting to learn that the first order placed with him was from the United States Navy Department. Mr. Nordenfeldt brought out similar guns in England. The three-pounder and six-pounder rapid-fire guns advertised for by France and Great Britain were intended for use against torpedo boats, and it was considered that the calibres selected were amply large. Later experience has modified this view, but it must be remembered that the torpedo boats of 1881 were small, slow, and weak. Rapid-firing guns soon began to increase in size. In a short time the calibre of 6 inches was reached, but the fixed ammunition was found to be unwieldy and easily sprung out of shape. The next step was the separation of the projectile and powder in the larger guns, retaining the brass case for inclosing the powder charge. The speed of fire in these guns was not reduced by the change, as the separate parts of the ammunition were more easily and rapidly handled.



UNITED STATES NAVY 5-INCH BREECH MECHANISM, MARK VII.
Breech open (from rear).



UNITED STATES NAVY 5-INCH BREECH MECHANISM, MARK VII.
Breech closed, ready to revolve plug and lock it.

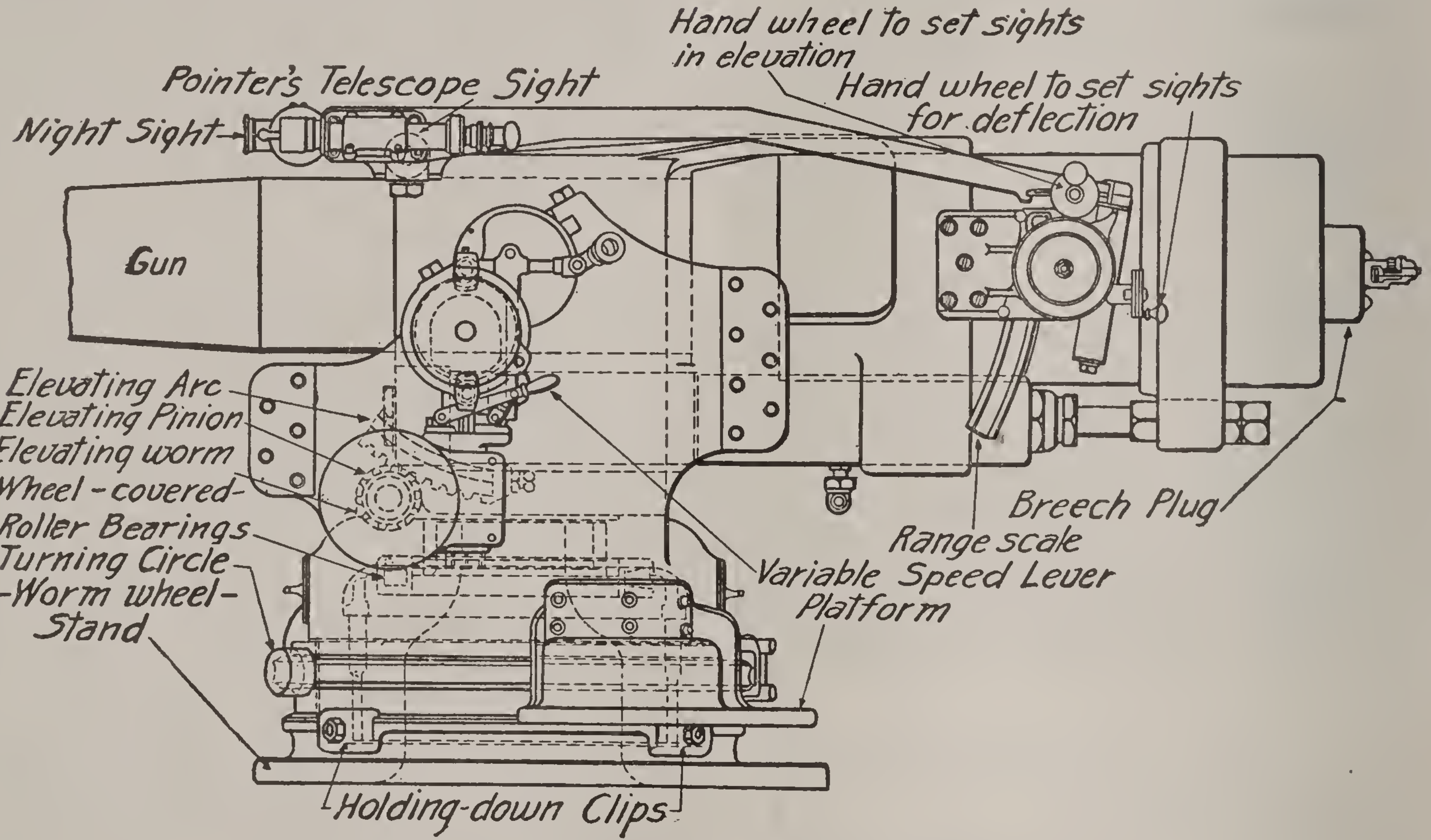
In 1897 the British firm of Vicker's Sons and Maxim brought out a new type of gun in which no powder case was used, the powder being in a bag as in old slow-firing pieces. The breech mechanism (see GUNS, NAVAL) was of a very rapid-working type, and the obturation (i.e., the sealing of the breech against the escape of gas to the rear) was effected by a modified form of the De Bange gas check. (See GUNS, NAVAL.) The empty primer case was automatically ejected when the breech was opened and a small loading tray brought up into position as soon as the plug was clear of the breech. A slightly modified form of the Vickers' mechanism was at once adopted for use in the United States navy for guns of 5 and 6 inch calibre. The guns of the new type were officially designated quick-fire to distinguish them from rapid-fire pieces using fixed ammunition. The actual rate of fire was about the same in the two classes.

The increase in speed of fire of the smaller calibres naturally led to improvements in the larger ones. Ambitious manufacturers announced 8, 9, and 10 inch rapid-fire guns, but they were not much faster working than the latest contemporary guns of equal size in nearly all navies. The terminology of naval guns remained thus confused and misleading for some time. Then the semiautomatic gun appeared. In pieces of this type the cartridge is loaded by hand, while the energy of recoil and counter-recoil is utilized to open the breech automatically, eject the empty case, cock the piece, and store energy in a breech-closing spring which closes the breech when its detent is struck by the rim of the cartridge as it goes home in the operation of loading. The gain in speed of operation effected by the semiautomatic mechanism is about 50 per cent. Fully automatic guns are not used, because the semiautomatic fittings give as great a speed of fire as will permit of accurate aim. In the United States navy all new guns of 3-inch calibre or less are of the semiautomatic type. Guns of 4-inch calibre are the only ones in which the simple rapid-fire features (hand loading, quick hand operating, and fixed ammunition) are retained.

Much continues to be done to increase the speed of fire of heavy naval guns. The plug has been decreased in weight through improvement in design, and is better supported in its carrier ring; instead of one-third of a revolution one-sixth suffices to unlock it. By suitable shaping of the screw box the plug can be at once swung out as soon as its threads are disengaged instead of requiring a movement directly to the rear before swinging to one side. In the new 12 and 14 inch guns the plug turns downward, and a spring effects its return with very slight hand assistance. The locks of all recent heavy guns for the United States navy are fitted to eject automatically the old primer case and insert a new primer when the plug is withdrawn. These improvements, assisted by speedier rammers and loading appliances, permit a rate of fire in 14-inch guns of three shots per minute. The best sustained speed of fire of naval guns is about as follows: 16-inch, 2 shots per minute;

15-inch, 2.5 shots; 14-inch, 12-inch, 11-inch, 10-inch, 3 shots; 9.2-inch, 5 shots; 8-inch, 7 shots; 7-inch, 10 shots; 6-inch, 15 shots; 5-inch, 17 shots; 4-inch, 20 shots; 3-inch semiautomatic, 30 shots; 6-pounder and 3-pounder semiautomatic, slightly faster. These rates do not include the time required to perfect the aim, which, under unfavorable circumstances, may be several seconds per shot.

With the appearance of the dreadnought type of battleship the decline of the rapid-fire gun as a battleship weapon began. Most dreadnoughts carry from 15 to 25 of them of a calibre between 5 and 6 inches, but these pieces are installed solely for protection against torpedo craft and will take no part in future battleship actions, which will be decided by the big guns. Under any but the most unusual circumstances no pieces except the big guns of the main battery would be manned in battle; to use the smaller guns would be to sacrifice their crews uselessly, as the decisive part of the engagement would probably take place beyond their range. Even if within range the damage they could inflict on a dreadnought would be trivial.



UNITED STATES NAVY 5-INCH MOUNT, MARK XIII, MODEL II, LEFT SIDE.

Rapid-fire guns of some sort are now carried by all large submarines. Recent boats of the United States navy are fitted with 3-inch semiautomatic guns and the large fleet submarines under construction are designed to carry 4-inch. Many late-type guns for submarines are fitted for vertical fire against air craft.

Bibliography. *Annual Reports of the Office of Naval Intelligence* (Washington, 1885–1902); *Proceedings of the United States Naval Institute* (Annapolis, Md., bi-monthly); *Annual Report* of the Chief of Bureau of Ordnance, United States Navy (Washington); *Annual Report* of the Chief of Ordnance, United States Army (ib.); also textbook of *Naval Ordnance*, published by the United States Naval Institute (Annapolis, 1915); Sir T. Brassey, *Naval Annual* (Portsmouth, 1886 et seq.); the *Sailor's Pocket Book* (ib., annually). For information concerning rapid-firing and other guns in the United States and abroad, including tables and full details, see Artillery; Field Artillery; Guns, Naval; Machine Gun; Ordnance; etc.

RAPID TRANSIT. See Electric Railways; Urban Transportation.

RAPIN DE THOYRAS, rȧ'păɴ' de twä'rä', Paul de (1661–1725). A French historian, born at Castres, Languedoc. He was educated at the Protestant College of Saumur and became an advocate in 1679, but the Revocation of the Edict of Nantes (1685) forced him to leave France and he sought employment in England and afterward in Holland. In 1693 he was appointed tutor to the Earl of Portland's son, with whom he traveled in Holland, Germany, and Italy, after which he took up his residence at The Hague, but in 1707 withdrew to Wesel in the Duchy of Cleves, where he devoted the remaining years of his life to the *Histoire d'Angleterre*, which was published at The Hague in eight volumes the year before the author's death. It was translated into English by Nicholas Tindal (15 vols., London, 1725–31).

RAPP, George (1770–1847). The founder of the religious society of Harmonists (q.v.). He was born at Iptingen in Württemberg, Germany. Desiring to organize a religious community in accordance with his ideas, he gathered a number of followers. Persecuted in Germany, in 1803 he emigrated to the United States and in 1804 he founded in Butler Co., Pa., a community in which all things were held in common and where both sexes practiced celibacy. In 1815 the society removed to the banks of the Wabash in Posey Co., Ind., and founded New Harmony (q.v.). Nine years later, however, they sold out their rights to the reformer Robert Owen (q.v.) and returned to Pennsylvania, where they built the village of Economy. Of these communities Rapp was both spiritual and temporal head.

RAPP, răp, Jean, Count (1771–1821). A French general, born at Kolmar, Alsace. He entered the army in 1788. As aid-de-camp to Desaix he distinguished himself by his gallantry in Egypt. On the death of his chief at Marengo he became aid-de-camp to Napoleon, and soon rose to be brigadier general. His brilliant charge at Austerlitz, which put to rout the Russian Imperial Guard, was rewarded with the grade of general of division. For his services in the battle of Aspern (q.v.) he was made a count of the Empire. Though opposed to the Russian expedition of 1812, he accompanied the Emperor throughout the whole of it, adding, on many occasions, to his military reputation. His defense of Danzig for nearly a year against a powerful Russian army added to his fame. The Russians, contrary to the articles of capitulation, sent Rapp and his garrison prisoners to Russia, and he was not able to return to France till July, 1814. On reaching Paris he was well received by Louis XVIII, and in March, 1815, was one of those sent to oppose the return of Napoleon, but deserted with his troops and was appointed by Napoleon commander in chief of the Army of the Rhine and peer of France. In 1818 Rapp was reinstated in the army by Louis XVIII. He left *Mémoires* (Paris, 1823). Consult Spach, *Le général Rapp* (Colmar, 1856).

RAP′PAHAN′NOCK RIVER. A river of Virginia, formed by several head streams in the Blue Ridge. It flows southeastward and enters Chesapeake Bay by a broad and long estuary running parallel with that of the Potomac and about 20 miles south of it (Map: Virginia, G 3). Its length is 250 miles. At Fredericksburg there is a fall supplying good water power, and below that point the river is a fine, navigable tidal stream for about 90 miles. Its chief tributary is the Rapidan.

RAPPERSWYL, răp′ĕrs-vēl, or RAPPERSWIL. A town in the Canton of Saint-Gall, Switzerland, 22 miles southeast of Zurich, on Lake Zurich (Map: Switzerland, C 1). In the old Hapsburg castle is the Polish National Museum, containing a collection of antiquities, sculptures, and paintings. The parish church, the town hall, and the viaduct connecting Rapperswyl with Hurden and Pfäffihon are also of interest. Rapperswyl dates from the twelfth century. Pop., 1900, 3412; 1910, 1954.

RAPPORT, răp-pōrt′; *Fr. pron.* rȧ′pôr′. See HYPNOTISM.

RAPTORES, răp-tō′rēz. See BIRD OF PREY.

RAR′ITAN. A town in Somerset Co., N. J., about 13 miles (direct) northwest of New Brunswick, on the Central Railroad of New Jersey (Map: New Jersey, C 2). It has woolen mills, stove and machinery foundries, and a grain mill. Water power is derived from the Raritan River. Pop., 1900, 3244; 1910, 3672.

RARITAN RIVER. A river of New Jersey. It is formed by two branches in the highlands in the northern part of the State and flows eastward into Raritan Bay, an inlet of Lower New York Bay (Map: New Jersey, D 2). It is 75 miles long and navigable to the fall line near New Brunswick.

RAROTONGA, rä′rō-tōn̄′gȧ. The largest of the Cook Islands (q.v.), in the Pacific Ocean.

RASCAL LEAF CRUMPLER. The larva of a phycitid moth (*Mineola indiginella*), which makes irregular crumpled cases on the apple leaves upon which it feeds. It works most extensively during May and June, when it is hidden by the foliage of the tree which it helps eventually to denude. The larval cases are plainly seen in the winter time attached in clusters to the twigs by means of strong silken threads, and in these cases the larvæ pass the winter about one-third grown. In the spring, when the leaves first begin to bud out, the larvæ begin to feed, and reach full growth in June. The pupa is formed within the larval cases, and the moth emerges in July, laying its eggs a little later. It feeds upon the apple and cherry, both wild and cultivated, upon the plum, quince, and crab apple, and to a lesser extent upon the peach. The best remedy consists in collecting and destroying in winter the plainly visible larval cases.

RASCHDORFF, räsh′dôrf, JULIUS (1832–). A German architect, born at Pless, Silesia, and educated at the Academy of Architecture in Berlin. In 1853 he became city architect at Cologne, where he restored the Rathaus and built the Stadt-Theater (1872), and with Felten the Municipal (Wallraf-Richartz) Museum (1855–61). The House of the Rhenish Estates (1879) at Düsseldorf, in the style of the Italian Renaissance, is also noteworthy. Appointed professor at the Academy in Berlin in 1878, he built the Technical Academy at Charlottenburg (with Hitzig, completed 1884), the Mausoleum of Frederick III (1894) at Potsdam, and was associated with his son, Otto, in the erection, from his designs, of the new cathedral (1894–1902). Of his publications the following are the most important: *Entwürfe und Bauausführungen im Stile deutscher Renaissance* (1879); *Baukunst der Renaissance* (1880–90); *Palastarchitektur von Oberitalien und Toscana* (2 vols., 1883–96; vol. iii, "Venedig," by his son Otto, 1894–1900); *Rheinische Holz- und Fachwerkbauten des 16. und 17. Jahrhunderts* (1895).

RASH (OF. *rasche, rasque*, Fr. *rache*, Prov. *rasca*, rash, scurf, itch, from Prov., Sp., Portug. *rascar*, to scrape, from Lat. *radere*, to scrape, shave). The common name of a skin eruption showing redness with but little elevation. It occurs typically in the exanthemata, such as scarlet fever, measles, etc. See ERYSIPELAS; ERYTHEMA; HIVES; URTICARIA.

RASHBAM. See RASHI.

RASH′DALL, HASTINGS (1858–). An English historian and clergyman, son of the vicar of Dawlish. Educated at Harrow and at New College, Oxford, he was ordained in 1884 and was tutor at Durham until 1888. He was fellow and lecturer of Hertford College, Oxford (1888–95), then fellow of New College and, after 1910, also lecturer. He was select preacher at Oxford (1895–97) and preacher at Lincoln's Inn (1898–1903), and in 1915 delivered the Bampton lectures. His life of Wiclif in the *Dictionary of National Biography* (1900) and his *Universities of Europe in the Middle Ages* (1895) are good examples of his fine scholarship. He also wrote: *Doctrine and Development* (1889), a volume of sermons; *New College* (1901), with R. S. Rait; *Christus in Ecclesia: Sermons on the Church* (1905); *The Theory of Good and Evil* (1907); *Philosophy and Religion* (1909); *Ethics* (1913); *Is Conscience an Emotion?* (1914), three lectures.

RASH′ER, or **RASCIERA,** rä′sē-ā′rȧ (perhaps from Sp. *rascacio*, sort of fish). One of the Californian rockfish (*Sebastodes miniatus*), peculiar in its deep vermilion color, mottled with yellowish pink and speckled on the back and sides with clusters of black dots, so that the whole body has a dusky shade. It comes about 2 feet in length and is a common market fish. See ROCKFISH.

RASHI, rä′shė (Rabbi Shĕlōmōh Yiṣhākī, or Solomon ben Isaac, often erroneously called Yarchi) (1040–1105). A great Jewish commentator and exegete. He was born in Troyes, France. He began his studies under his father and continued them at Worms, at Mainz, and at Speyer under distinguished Jewish scholars. Returning to Troyes, he established a school for the study of the Bible and Rabbinic literature, and his fame drew scholars from far and wide. Rashi's reputation is greatest as a commentator. His Bible commentary is complete except from Job xl. 21 to the end of Chronicles. It was the first Hebrew book printed with date (1475), and is still generally included in good editions of the Bible for Jews. It has been translated into Latin by Breithaupt (Gotha, 1710–14). The renderings are generally the traditional ones and Midrashic authorities are followed, but simple literal explanations are also given. Through Nicolas de Lyra, who copied him extensively, his influence was felt on Luther's version, and through Ibn Ezra and David Kimbi on the English version. Rashi also wrote a few liturgical poems of little value, and a famous commentary to 23 treatises of the Talmud, which was supplemented by his grandson, Rabbi Samuel ben Meir (Rashbam). This always accompanies editions of the Talmud. His commentaries contain 3157 *la 'azim,* or French vocables, forming a vocabulary of 2000 distinct words, which have a great value as providing material for the reconstruction of Old French. Consult: Zunz, in *Zeitschrift für die Wissenschaft des Judenthums* (Berlin, 1822); Kronberg, *Raschi als Exeget* (Halle, 1882); Darmesteter, *Reliques scientifiques* (Paris, 1890); H. H. Graetz, *History of the Jews* (Eng. trans., Philadelphia, 1891–98); Morris Liber, in *The Jewish Encyclopædia* (New York, 1905).

RASK, räsk, RASMUS KRISTIAN (1787–1832). A Danish philologist. He was born at Brændekilde, near Odense, in the island of Fünen, studied at Copenhagen, and in 1808 published his first work, an introduction to the Icelandic language. In 1811 he published in Danish an *Introduction to the Grammar of Icelandic and Other Ancient Northern Languages* and in 1814 he edited the *Icelandic Lexicon* of Björn Halldórsson. In 1813 he went to Iceland, where he lived for two years, perfecting his knowledge of the language and history of the inhabitants. On his return to Copenhagen he was appointed assistant librarian to the university, and in 1818 published his researches on Icelandic, which led Grimm to his discovery of the sound shifting in the Germanic languages. (See GRIMM'S LAW.) He left Denmark in 1816 on a literary expedition, and after spending two years in Stockholm, where he published his *Anglo-Saxon Grammar* (1817; new ed. in English by Vernon, London, 1865) and the first critical and complete edition of the *Snorri Edda* and the *Edda Sæmundar* (1818), he went to Finland, next to St. Petersburg (1819), where for two years he studied Sanskrit, Persian, Arabic, Russian, and Finnish. He then went to Astrakhan, where he studied the languages of the Tatars, and then began a journey through the country of the Turkomans, the Caucasus, Persia, Hindustan, and finally Ceylon, where he wrote his *Singalesisk Skriftlære* (1822). In 1823 Rask returned to Copenhagen; in 1825 he was appointed professor of literary history and in 1828 of Oriental languages. In the following year he was made chief custodian of the university library and in 1831 professor of the Oriental languages. But his immense labors had exhausted his energies and he died at the early age of 45. Besides the productions already mentioned Rask wrote a Frisian grammar, *Frisisk Sproglære* (1825); *Den gamle Aegyptiske Tidsregning* (1827); *Den ældste Hebraiske Tidsregning* (1828); *Om Zendsprogets og Zendavestas Ælde og Ægthed* (1826); also grammars of several modern languages and a great number of miscellaneous articles which were collected after his death and published (3 vols., 1834–38). Besides anticipating Grimm in the discovery of the famous law of consonantal shifting, Rask was the first to recognize the kinship of the Germanic languages with Greek, Latin, and Balto-Slavic. Consult, for his bibliography: P. E. Müller, *Biographiske Efterretninger* (Copenhagen, 1833); N. M. Petersen in the complete edition of Rask's works (ib., 1838); Henrichsen, *Rask's Skoleliv* (Odense, 1861); Rönning, *Rask* (Copenhagen, 1887); Wimmer's memorial address (ib., 1887); B. M. Olsen, *Rask* (Reykjavík, 1888). For his correspondence, see Grimm brothers, *Briefwechsel mit nordischen Gelehrten* (Berlin, 1885).

RASKOLNIKI, râs-kôl′nyĭ-kĭ, or **RASKOLNIKS,** râs-kôl′nyĭks (Russ., schismatics). The generic name applied to all those of the Greek faith who dissent from the established church in Russia. The name used by the Raskolniki themselves is Staroobryadtsy (old ritualists) or Starovyertsy (old believers). They represent the extreme conservatism which refused to lay aside forms of worship to which it was accustomed. The immediate occasion of schism was the correction of the old ecclesiastical books. In the first quarter of the sixteenth century Maximus, a Greek monk from Athos, was engaged by the Czar to correct the errors which had crept in, but the revision was rejected and he himself imprisoned. The Hundred Chapter Council of 1551 undertook a correction by collating current translations and not by comparing them with the Greek originals, and still more errors crept in. In the middle of the seventeenth century the Patriarch Nikon (q.v.) undertook a new revision on the basis of old Greek and Slavonic texts. Nikon's opponents—and he had many, owing to his domineering spirit—now made the revision a point of issue in their controversy with the Patriarch. Prominent among them were the popes (priests) Lazar and Nikita, the deacon Fyodor, and especially the protopope Avvakum, a man uncommonly well read and a forceful speaker. Ecclesiastical councils in 1654, 1656, 1666, and 1667 approved the corrections in the service books and anathematized those who refused to accept them. The latter were now officially called Raskolniki, and from this time dates the rise of the *raskol.* Most of the dissenters were banished to remote monasteries, like that at Solofki on the White Sea. The Raskolniki kept up their objectionable propaganda from their places of confinement, and after a seven years' siege the monastery at Solofki was taken in 1676, the rebellious monastics were punished without quarter, and in 1681 Avvakum was executed. The antigovernmental spirit moved the Raskolniki to take a prominent part in the insurrections of the Streltsy (q.v.), and the Regent, Sofia, executed many of them in 1684.

About 1685 there came a split in the ranks of the Raskolniki. Since they had no bishop to ordain priests there was danger that, upon the death of the priests who had separated with them, the true church itself would disappear and all connection with Christ vanish from the earth. The more moderate among them held that orders in the Orthodox church were still valid, and depended upon converted priests or those deposed from the Orthodox church. They are called *Popovtsy* (having priests). In 1832 they were forbidden to receive priests from the Russian church, but in 1846 induced a deposed Bishop of Bosnia, Ambrosius, to become their head, with a residence in Belo-Krinitza in Bukovina. He was succeeded by a Russian, Cyril. The more extreme regarded the Orthodox church as having, by anathematizing the true believers, lost its validity. These are called the *Bezpopovtsy* (priestless), and are the more irreconcilable of the Raskolniki. With no priests and no sacraments excepting baptism, which a layman may administer, they can have no church. Their leaders are elders whom they elect. They rigidly observe the fasts of the church and whatever ceremonies can be performed without priests. A great number of sects, some very extreme, have risen among them, often rapidly spreading and disappearing. The question of marriage, which in Russia was only legal if performed by a priest, presented peculiar difficulties, and some held that celibacy was the only Christian method of life left to them. In 1874 the government allowed special registers to be kept for the Raskolniki and their marriages to be recorded without the Orthodox ceremony. The former centre of the *Popovtsy* was the island of Vielka, in a tributary of the Dnieper, in Poland. This was destroyed in 1735 and again in 1764 and many were exiled to Siberia. In 1771 they were allowed a centre in Moscow. They are found especially in Great Russia, among the Cossacks of the Don, and along the banks of the lower Volga. The *Bezpopovtsy* flourished in the north, between the great lakes and the White Sea, whence they were called *Pomoryane* (sea dwellers), and spread through the northern Urals and Siberia. A convent on the Vyg was their centre, but in 1771 they also were allowed a centre in Moscow, whence they spread widely.

The government dealt severely with the Raskolniki from the outset, the law of April 17, 1685, prescribing death, almost without exception, to those persevering in the schism or assisting its adherents. In 1716 they were permitted to settle in cities on the payment of a double tax, but were not permitted to appear as witnesses against orthodox persons. The successors of Peter I increased the severity of the enactments against them. In 1752 labels were required on their dress as a distinguishing mark. In 1768 and 1778 ukases forbade the building of churches and chapels and the use of bells. From 1769 on they could again appear as witnesses in court, the double tax was removed in 1782, and the following year the name Raskolniki was discontinued in official documents. Under Paul I (1796–1801) their lot grew worse, and under Alexander I, in 1803, the word Raskolniki reappears in state papers. They were officially subdivided into three classes: I. Most obnoxious: (1) the Judaizers; (2) the Molokani (q.v.), who recognize no authority and object to taking oaths; (3) Dukhobortsy (q.v.), a variety of the preceding; (4) the Khlystovtsy, who introduce anthropolatry; (5) the Skoptsy (q.v.), enemies of society, and blasphemous as deriving their sect from Christ (none of whom are, properly speaking, Raskolniki or Old Believers); (6) those Bezpopovtsy who oppose marriage and praying for the Czar. II. Obnoxious: the Bezpopovtsy who recognize marriage and pray for the Czar; these are harmful as being against priests and the Eucharist and also on account of their democratic teachings. III. Least obnoxious: the Popovtsy, rather schismatics than heretics, as they keep most of the church requirements and give most promise of reforming. The law of May 3, 1883, brought considerable relief to the schismatics. In April, 1905, an Imperial decree effected a radical improvement in the condition of the Raskolniki. They were divided into three groups, Old Believers, Sectarians, and adherents of erroneous doctrines, amenable to judicial punishment. Old Believers are those Raskolniki who acknowledge the fundamental doctrines of the Orthodox church while deviating in certain rites and forms. Old Believers and Sectarians are accorded the rights of public worship, of possessing real and personal property, and of establishing hermitages, monasteries, and schools. Closed meeting houses were to be reopened. Secession from the Orthodox church was permitted.

In general the Raskolniki are counted among the most industrious, sober, and intelligent elements of the Russian population. As to their numbers a serious divergence of statistical data seems to be the rule; many Raskolniki conceal their faith before the magistrates, and even of those registered the governmental reports give only a small fraction, for fear of increasing their popularity with the masses. Thus, e.g., when the official returns in 1870 gave their number as 1,171,000, the foreign newspapers, on the basis of the secret governmental documents, gave a figure almost ten times as high. On this basis, says the Russian Encyclopædia, one can approximately guess their total number, when the report of the Holy Synod for 1893 places them a little below 2,000,000.

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RASLE, SÉBASTIEN. See RALE, SÉBASTIEN.

RASMUSSEN, räs′mus′sen, KNUD (JOHAN VICTOR) (1879–). A Danish Arctic explorer, born and bred in Greenland, where his father was a missionary. He graduated at the University of Copenhagen. Rasmussen journeyed to Lapland (1901) and participated in the Danish Literary Greenland expedition under Mylius-Erichsen (1902–04), which spent 10 months in a study of the heathen Eskimo of Cape York, Greenland. He made ethnological expeditions to Greenland in 1905–08, 1909, and 1910. His ethnological researches have been translated from the Danish originals and published as *The People of the Polar North* (1908). Later plans to study the home life of the Eskimo of continental America failed of support. He made (1912) a remarkable crossing of Greenland for the recovery of the Mylius-Erichsen (q.v.) records, which were found by Mikkelsen (q.v.). Rasmussen's outward journey, 764 miles across the inland ice, was made from Inglefield Gulf to the Danmark Fiords, thence to Independence Bay, and a return (1914), 621 miles, to Wolstenholme Sound. He found Peary Channel to be nonexistent, and discovered a large area of ice-free land, with ample game in that region. He also wrote *Lapland* (1907) and *Avangarnisalerssârutit* (Eskimo). Consult *Geographical Journal* (London, December, 1913).

RASORES, rȧ-sō′rēz. See GALLINÆ.

RASP. See FILE.

RASPAIL, rȧs′pä′y′, FRANÇOIS VINCENT (1794–1878). A French revolutionary leader, also a naturalist. He was born at Carpentras, Vaucluse, and went in 1815 to Paris. There he became the editor of radical papers and fought at the barricades in the revolution of 1830. He opposed the government of Louis Philippe and was prosecuted for his newspaper articles and for his connection with illegal societies. As leader of a mob (Feb. 24, 1848) he forced the provisional government to proclaim the Republic, and with Barbès and Blanqui headed the insurrectionists who invaded the hall of the National Assembly on May 15. He was sentenced to five years' imprisonment. He was a member of the Corps Législatif in 1869 and of the Chamber of Deputies in 1876–77. As a naturalist he became known through his enthusiastic advocacy of camphor as an antiseptic. He wrote on chemistry and plant physiology.

RASPBERRY, răz′bĕr-ĭ *or* räz′bĕr-ĭ (from *rasp*, OF. *rasper*, Fr. *râper*, from ML. *raspare*, to scrape, from OHG. *raspōn*, to scrape together (connected with Ger. *rappen*, to seize, Eng. *rap*) + *berry;* so called from the rough surface). Several species of the genus *Rubus*, of the family Rosaceæ. The blackcap or black raspberry (*Rubus occidentalis*) is an American species with white flowers and purplish-black fruits consisting of numerous drupes joined together. Yellow or amber fruited forms also occur within this species. Since its introduction in 1832 the black raspberry has become one of the most important of bush fruits and is extensively raised for dessert, canning, and evaporating. In nature the tips of recurved stems of the present season's growth take root during midsummer and late autumn and give rise to a new plant—a habit utilized in cultivation. In commercial plantations the plants are set in rows 3 by 8 feet apart and are given clean culture until time to put down the stem tips, when cultivation ceases. The first return, then, from a new raspberry patch is a crop of plants. The new shoots which spring up from the roots are cut back to 18 or 20 inches, when about that height, to induce the formation of fruit-bearing wood. As soon as the crop is gathered the canes which have borne are cut away to increase the strength of the new wood which is to bear the following season's crop. The crop is usually picked by hand; many growers, however, use a simple device consisting of an apron with a shallow box attached, into which the ripe fruit is jarred. After the fruit is dried it is run through a fanning mill to separate any leaves or twigs which fell with the fruits into the picking box.

Two species of red raspberries are cultivated, the native American red raspberry (*Rubus strigosus*) and the European (*Rubus idæus*). These two plants are closely related botanically, but differ under cultivation, a marked distinction being the habit of the European species to continue fruiting throughout the season after ripening begins. This is a disadvantage to the commercial grower, but an advantage to the amateur. The European sorts are less hardy than the natives, and cannot be relied upon in the Northern States except in sheltered positions. The number of foreign varieties cultivated in the United States is comparatively small. Out of a total of 100 or more introductions not more than 6 or 8 have stood the test. Both forms of red raspberry propagate readily from sprouts and root cuttings. As a result of the habit of sprouting the patches soon present the character of a matted row, although they are usually planted 3 by 6 feet apart in original plantations. Thorough cultivation is necessary, not only for the purpose of stimulating growth, but in order to hold the plants within bounds. The fruit of these species cannot be successfully gathered by machinery and is never evaporated. Its chief use is for dessert purposes, although the fruit is also prized in wine making, for jam, and for canning.

The thirteenth census states the value of the raspberries produced in the United States in 1909 at $5,132,277.

Another important group of purplish-red raspberries seems to have resulted from the crossing of *Rubus occidentalis* and *Rubus strigosus.* In habit of growth the plant resembles the black raspberry more closely than the red, since it propagates by tips, has a firmer fruit than the red, with greater size and much better flavor than the black. For shipping it is much better than the red and for dessert purposes superior to the black. Flowering raspberry (*Rubus odoratus*) is often planted for ornament. See Plate of RUBUS.

RASPBERRY DISEASES. The fungus diseases of the raspberry, blackberry, and dewberry are the same and at times work serious injury. Among the most important are anthracnose and orange rust. The anthracnose (q.v.) (*Glœosporium venatum*) is first indicated by the appearance of small rapidly growing purple spots upon the young shoots near the ground. As these spots enlarge and extend around the stems the centres become dirty white, the spots coalesce and rupture the epidermis, and the canes die as though girdled by a knife. The fruit may shrivel and remain upon the stems. Rust (*Cæoma nitens* or *Gymnoconia interstitialis*) attacks and dwarfs the young growth. Soon the leaves turn yellow and both they and the young stems become distorted and covered with masses of orange-colored spores, which rapidly spread the disease. The remedy recommended for the former is spraying with a fungicide (q.v.), for the latter digging and burning. In Colorado, injury to red raspberries due to *Sphærella rubina* is reported. Spraying with Bordeaux mixture, together with cutting out and burning the old canes, has proved an efficient means of control. The raspberry is especially subject to crown gall, a disease caused by *Bacterium tumefaciens.* A disease known as yellows has been reported in Ohio and Canada. Cane blight, due to *Coniothyrium fuckelii*, is also destructive. All diseased canes should be gathered and burned.

RASPBERRY INSECTS. The canes of raspberry bushes are attacked injuriously in the

United States by two species of beetles. The raspberry cane borer (*Oberea bimaculata*) lives in the larval state in the centre of the cane, where it burrows downward, often causing the death of the cane. It is a native insect, feeding in the wild raspberries, but has transferred its attention to the cultivated varieties. The perfect insect is a cerambycid or long-horned beetle, with a long and narrow black body, the top of the thorax being pale yellowish. It appears in June, and the female lays her eggs towards the end of that month, girdling the young growing cane near the tip in two places and inserting the egg between the girdles. This insect feeds in blackberry as well as in raspberry stems. The remedy consists in pruning the girdled tips as soon as observed, and they are very evident from the withering of the terminal leaves. The other cane borer is the red-necked *Agrilus* (*Agrilus ruficollis*). This is a buprestid beetle which lays its eggs in the stems of raspberry and blackberry, and the resultant larva makes a swelling in the cane. Several larvæ will be found under the bark of one of these swellings, and when full-grown they penetrate to the pith and transform to pupæ from which the perfect beetles escape early in the summer.

Raspberry canes are sometimes damaged to some extent by the snowy tree cricket (*Œcanthus nivcus*), which perforates the stems to a distance of an inch or more, inserting its eggs in the perforations. This is the only damage done by this insect, which, after it issues, feeds upon plant lice. The raspberry sawfly (*Selandria rubi*) in the larval condition feeds upon the leaves and transforms to pupa at the surface of the ground or a little below the surface. This insect is destroyed, when abundant, by sprinkling with hellebore and water. Several species of Lepidoptera in the larval state feed upon the leaves of raspberry, and there is a little measuring worm which feeds upon the fruit. This species (*Synchlora œrata*) reaches full growth about the time of the ripening of the raspberry, when it is about ¾ inch long, of a yellowish-gray color, each segment being furnished with several sharp thorns. It has the habit of disguising itself by attaching to these thorns small bits of vegetable matter, such as the anthers of flowers and bits of leaf. The adult moth is of a delicate pale-green color and has a wing expanse of about ½ inch. The flealike negro bug (q.v.) is often found upon raspberries, and its presence may be discovered by the disagreeable odor of the fruit. The insect is so small that it is often taken into the mouth unnoticed until the disgusting flavor reveals its presence. Consult Slingerland and Crosby, *Manual of Fruit Insects* (New York, 1914).

RASPBERRY WORM. See RASPBERRY INSECTS.

RASPE, räs′pe, RUDOLPH ERICH (1737–94). A German-English writer and mineralogist, born in Hanover. He studied in 1756–60 at Göttingen and Leipzig. In 1767 he became a professor in the Collegium Carolinum at Cassell and curator of the landgrave's cabinet of antiquities and coins. During this time he translated (1765) Leibnitz's philosophical works, wrote the poem *Hermin und Gunilde* (1766), and published a critical treatise on Percy's *Reliques* and papers on geology and mineralogy. In 1775 he was charged with purloining coins and other articles of value, and fled to England, where he published *Some German Volcanoes and their Productions* (1776), a translation of Lessing's *Nathan der Weise* (1781), and, with the assistance of Horace Walpole, a treatise on the origin of painting in oil (1781). Later he became assay master at mines in Dolcoath, Cornwall (1782–85), and compiler of the excellent *Descriptive Catalogue* of more than 15,000 casts of gems forming the collection of James Tassie of Edinburgh. In 1791 he was in the north of Scotland, where he obtained from a certain Sir John Sinclair funds for metallurgical experiments. He then decamped with the money to Muckross, County Donegal, Ireland. This incident was introduced by Scott in *The Antiquary.* Raspe published in 1785, in chapbook form, *Baron Münchhausen's Narrative of his Marvelous Travels and Campaigns in Russia.* See MÜNCHHAUSEN.

RASPUTIN, rȧ′spo͞o-tēn′, GREGORY (c.1870–1916). A Russian monk and royal favorite, born at Petrovsky in the Province of Tobolsk, Siberia. He was introduced into society circles in St. Petersburg and, although of peasant origin, eventually he became intimate even with the Emperor Nicholas himself. It was generally understood that because of supposed mystic powers he exercised much influence over both Czar and Czarina. Rasputin had been credited with many scandalous intrigues and with living a generally immoral life, and a crisis came in 1914, when he was stabbed by a woman friend of a girl he had betrayed. He had the services of the Czar's physician and recovered.

RÄSS, rĕs, ANDREAS (1794–1887). A German theologian, born at Sigolsheim, Alsace, and educated in Mainz. He was ordained priest in 1816. In 1842 he was nominated Bishop of Strassburg. At the Vatican Council he was a stanch supporter of the dogma of infallibility. Räss founded the periodical *Der Katholike* and wrote many theological treatises. His printed works include *Konvertiten seit der Reformation* (1866–80), and together with Weiss, Bishop of Speyer, he published *Leben der Väter und Märtyrer* (23 vols., 1821–27), a translation of Butler's *Lives of the Saints.*

RASSAM, rȧs-säm′, HORMUZD (1826–1910). An Assyriologist, born of Nestorian parents at Mosul, Asiatic Turkey. He acted as agent and overseer for Layard (q.v.) during his expedition in 1845–47, studied at Oxford (1847–49), and again assisted Layard in his Assyrian excavations (1849–51). In 1852–54 he was in charge of the excavations at Kalat Sherkat, Nimrud, and Kuyunjik for the British Museum, and discovered the palace of Asurbanipal and the second half of the library at Kuyunjik. (See NINEVEH.) Later he held government appointments at Aden and Muscat. When, in 1864, King Theodore of Abyssinia had imprisoned the English consul and a number of Germans, Rassam succeeded in securing their freedom. But they were soon imprisoned again, and he was himself jailed and kept in chains from 1866 until Sir Robert Napier's victory over the Abyssinians at Magdala in 1868. After the sudden death of George Smith (q.v.) in 1876 Rassam was asked to take charge of excavations in Assyria. He was first sent, however, during the Russo-Turkish War (1877) to inquire into the conditions of the Christian communities in Asia Minor, Armenia, and Kurdistan. From 1878 until July, 1882, he was almost continuously in the field, both in Assyria and Babylonia. He made many important discoveries, such as the bronze gates of Balawat (q.v.), obtained a large number of valuable inscriptions, and identified and partially excavated Sippara, the modern Abu Habba. Among his publications are *The British Mission to Theodore, King of Abyssinia* (1869), and *Asshur and the Land of Nimrod* (1897). An obituary in the *Times* (London, Sept. 17, 1910) gives an extended account of his career.

RASSE, răs′*e or* răs (from Jav. *rasa*, from Skt. *rasa*, flavor, taste). A Malacca weasel. A small civet (*Viverricula malaccensis*), which inhabits the Malay Peninsula, eastward to Formosa, and also the island of Madagascar, where it was probably introduced long ago. It differs from the ordinary civets, being of slighter build, enabling it to climb trees, and in lacking a mane. It has along its back and sides seven blackish stripes, more or less broken into spots, some curving bars on the throat, and a long, tapering, dark-ringed tail. Civet (q.v.) is obtained from this animal.

RAS′SELAS. A prose romance by Dr. Samuel Johnson (1759), written during the evenings of one week to defray the expenses of his mother's funeral.

RASTATT, or **RASTADT**, rä′stät. A town in the Grand Duchy of Baden, Germany, on the Murg, 3 miles from its junction with the Rhine and 15 miles by rail southwest of Karlsruhe (Map: Germany, C 4). Its strong fortifications were dismantled in 1890. The town has a large palace (now a barracks), a Gymnasium, and an industrial school. It manufactures iron stoves, beer, tobacco, and lace. Rastatt is memorable for the two congresses held here. At the first, in 1714, a treaty of peace (following that of Utrecht) was signed which brought the War of the Spanish Succession to a close. The second congress was that of 1797–99 between France and the German Empire. It effected nothing, a new coalition having been formed against France. Its dissolution was followed by the assassination of two of the French delegates, a crime which aroused great indignation throughout Europe. The Baden revolution in 1849 began and ended in Rastatt, which finally surrendered to the Prussians. Pop., 1900, 13,940; 1910, 15,196. Consult Hüffer, *Der Rastatter Gesandtenmord* (Bonn, 1896).

RASTENBURG, räs′ten-burk. A town in the Province of East Prussia, Prussia, on the Guber River, 64 miles southeast of Königsberg by rail (Map: Germany, J 1). It has a royal Gymnasium. Among the industrial establishments are iron and brass foundries, a sugar factory, flouring mills, etc. Pop., 1900, 11,144.

RASTOPTCHIN. See ROSTOPTCHIN.

RAT (AS. *rætt*, OHG. *ratto*, Ger. *Ratte*, Fr., Prov. *rat*, It. *ratto*, rat; of uncertain etymology). Any of the larger rodents of the genus *Mus*. (See MOUSE.) Two species are very widely distributed over the world—the black rat (*Mus rattus*) and the brown rat (*Mus decumanus*). Both appear to be natives of central Asia. The black rat found its way to Europe about the beginning of the sixteenth century, but the brown rat did not reach England until about 1728. It received the name of Norway rat, from a belief that it was introduced from Norway. The date of introduction into America is very doubtful, but the black or Alexandrine rat seems to have come first, and has been gradually driven westward by its large and more savage cousin. Both infest ships and are thus conveyed to the most distant parts of the world, and both are wharf rats.

The black rat is nearly 7½ inches in length, exclusive of the long tail. The brown rat attains a length of more than 10½ inches. Besides its large size and comparative shortness of tail, it differs from the black rat in its smaller ears and less acute muzzle, as well as in its lighter color and shorter hair. Both species are extremely prolific, breeding at a very early age, several times in a year, and producing from 10 to 14 at a birth.

Rats feed indiscriminately on almost any kind of animal or vegetable food; they make depredations in fields of grain and pulse, from which they often carry off large quantities to be stored in their holes, and thus have become a serious pest in the West Indian sugar plantations. They devour eggs; they kill poultry, partridges, and the like, and become a pest of ill-kept dwellings and storehouses. Their strong rodent teeth enable them to gnaw very hard substances, such as wood and lead pipes, either for food or in order to make their way to food. They are creatures of no little intelligence, and many curious stories are told of the arts which they employ to attain desired objects, of the readiness with which they detect the approach of danger and the skill with which they avoid it. Under certain circumstances they undertake migrations in large companies. Their sense of smell is very acute, and the professional rat catcher is very careful that the smell of his hands shall not be perceived on the trap. They are capable of being tamed, and have in some instances proved interesting pets.

The flesh of rats is seldom eaten. The skin is used for making a fine kind of glove leather. During the prevalence of the bubonic plague in India, Australia, and Cape Colony, in the latter part of the nineteenth century, it was ascertained that there was a direct connection between the prevalence of the disease and the abundance of rats, and it was shown that the rats were themselves liable to the plague and myriads perished from it. Investigation showed that the fleas with which rats are infested are hosts for the plague germ and that thus rats unwittingly served as an important means for spreading the disease.

RAT, PHARAOH'S. See MONGOOSE.

RATÆ, rā′tē, or **RA′TÆ CORITANORUM.** The Roman name of the town of Leicester (q.v.).

RATAFIA, răt′ȧ-fē′ȧ (Fr. *ratafia*, from Malay, *araq*, from Ar. *'araq*, arrack, from *'araqa*, to sweat + Malay *tāfīa*, spirits distilled from molasses, Eng. *taffy*). A cordial flavored with fruits or the kernels of fruits. The name is used generically to include several varieties of fruit liqueurs. Procope, the ancient master distiller of Paris, includes under this term liqueurs, or sirups, of cherries, strawberries, gooseberries, apricots, peaches, and other fruits. Consult Mew and Ashton, *Drinks of the World* (New York, 1892). See LIQUEUR.

RATAN. See RATTAN.

RATCH′FORD, MICHAEL D. (1860–). An American labor leader, born at Clare, Ireland. He emigrated to the United States with his parents in 1872 and began work in coal mines when 12 years old. He was president of the miners at Massillon, Ohio, in 1890–92, and served as general organizer (1893–94) and president (1895–96) of the Ohio miners. In 1897–98, while president of the United Mine Workers of America, Ratchford gained a standard eight-hour day throughout the bituminous coal fields and brought about uniform working conditions in the mines. He served as a member of the National Industrial Commission from 1898 to 1900, as commissioner of labor statistics of Ohio in 1900–08, as commissioner of the Ohio Coal Operators in 1909–12, and as commissioner of the Illinois Coal Operators' Association after 1913.

RATE. The term applied to the taxes assessed and collected by local authorities in England. The objects subject to taxation being assessed, a rate is fixed sufficient to bring in the needed income. The taxes being imposed by various administrative bodies such as the counties, or poor-law districts, we find frequent references to county rates, poor rates, etc. As the entire revenue of local bodies rests upon this basis, the term "rate" is frequently used by English writers as synonymous with direct taxation, other forms of taxation being designated customs, duties, imposts, etc.

RA'TEL (Fr., dim. of *rat*, rat), or HONEY BADGER. A badger-like animal of South Africa. See BADGER.

RATH, rät, GERHARD VOM (1830–88). A German mineralogist, born at Duisburg and educated in Berlin, Bonn, and Geneva. In 1863 he became professor of mineralogy at the University of Bonn and a few years afterward was made director of the Mineralogical Museum there. He made scientific researches in mineralogy, petrology, and especially in the geology of the Rhine, the Alps, and Italy. He also investigated earthquakes and meteorites. Rath traveled much in southern Europe, Palestine, and the United States. His discoveries appeared in various journals and in: *Ein Ausflug nach Kalabrien* (1871); *Naturwissenschaftliche Studien* (1879); *Durch Italien und Griechenland nach dem Heiligen Land* (1882).

RATH'BONE SISTERS, ORDER OF. See PYTHIAS, KNIGHTS OF.

RATH'BUN, RICHARD (1852–). An American zoölogist and administrator, born in Buffalo, N. Y., and educated at Cornell. He was assistant in zoölogy to the Boston Society of Natural History (1874–75), then for three years assistant geologist on the Geological Commission of Brazil, and assistant in zoölogy at Yale (1879–80). Thereafter he was connected with the Smithsonian Institution, of which he was assistant secretary after 1887, and in 1899 he took charge of the United States National Museum. Rathbun represented the United States on the joint commission with Great Britain relative to the preservation of fisheries in waters contiguous to the United States and Canada (1892–96). He published various articles relating to zoölogy and to problems of museum administration.

RATHENOW, rä'te-nō, or **RATHENAU.** A town in the Province of Brandenburg, Prussia, on the Havel, 45 miles west-northwest of Berlin (Map: Germany, E 2). It manufactures glass, optical instruments, furniture, asbestos, bricks, machinery, wagons, and stoves. Pop., 1910, 24,901.

RATHGEN, rät'gen, CARL (FRANZ THEODOR) (1856–). A German economist and writer on Japan. A grandson of the historian B. G. Niebuhr, he was born in Weimar and was educated at Strassburg, Halle, Leipzig, and Berlin. From 1882 to 1890 he was professor in the Imperial University of Tokyo, in 1892 became docent at the University of Berlin, and in 1893 professor at Marburg. Rathgen accepted a chair at Heidelberg in 1900 and in 1907 went to the Hamburg Colonial Institute. In 1913–14 he lectured at Columbia University, New York. He wrote: *Japans Volkwirtschaft und Staatshaushalt* (1891); *Die englische Auswanderung und Auswanderungspolitik im 19. Jahrhundert* (1896); *Die Japaner und ihre wirtschaftliche Entwicklung* (1905; 2d ed., 1911); *Staat und Kultur der Japaner* (1907).

RATHMINES (răth-mīnz') **AND RATHGAR,** -gär'. A municipality of Leinster, Ireland, suburban to Dublin (q.v.). Pop., 1901, 32,602; 1911, 37,840.

RATHSAMHAUSEN, LUDWIG SAMSON, BARON VON TANN-. See TANN-RATHSAMHAUSEN, L. S.

RATIBOR, rä'tê-bôr. A city in the Province of Silesia, Prussia, on the Oder, 44 miles south-southeast of Oppeln (Map: Germany, H 3). It has a handsome courthouse, a theatre, and a Gymnasium. It has iron foundries and machine shops and manufactures snuff, sugar, chocolate, paper, furniture, and chemicals. The town was the capital of the former Dukedom of Ratibor. Pop., 1900, 25,236; 1910, 38,405.

RATICHIUS, râ-tĭk'ĭ-ŭs (Ger. RATKE, or RATICH), WOLFGANG (1571–1635). An educational reformer, born at Wilster in Holstein and educated at the Hamburg Johanneum and the University of Rostock. While sojourning in Holland (1603–11) he devised a new method for teaching languages quickly. He tried to interest the Prince of Orange in his method, but, failing, he betook himself to Germany. At Amsterdam, Basel, Strassburg, Frankfort, Weimar, Augsburg, Köthen, and various other places he put into operation his method of instruction. His executive ability, however, was not commensurate with the scope of his ideas, and consequently he failed in all his undertakings. His fundamental idea of method was that nature should be followed, meaning by that that there is a natural sequence along which the mind moves in the acquisition of knowledge, through particulars to the general, thus for the first time applying the Baconian theory of induction in education. His work was overshadowed by that of the more successful Comenius (q.v.). Consult: Barnard, *German Teachers and Educators* (Hartford, 1878); Quick, *Educational Reformers* (New York, 1890); G. Vogt, *Wolfgang Ratichius, der Vorgänger des Amos Comenius* (Langensalza, 1894). See EDUCATION; PEDAGOGY.

RAT'IFICA'TION (ML. *ratificatio*, from *ratificare*, to ratify, from Lat. *ratus*, fixed, settled + *facere*, to make). In law, acts or words by which a person adopts as his own obligation the legal effect of an unauthorized act done by another on his behalf or for his benefit, or by which a person confirms and assents to be bound by a voidable obligation. The doctrine is of most frequent application in the law of agency and in the ratification by a person of an act creating a contract obligation performed by him during minority. If a person ratifies and accepts the benefits of an act, he must also be responsible for any consequences of the act, such as damage committed by the unauthorized person in doing it. Ratification may be *express*, i.e., by assent expressed in positive terms, or *implied*, from acts from which a reasonable person would infer assent.

In Scots law the term is applied to the separate acknowledgment of a married woman that a deed executed by her is voluntary and made with full knowledge of its legal effect. See Agent; Contract; Infant; and consult the authorities referred to under Contract.

RATIO. See Proportion.

RATIOCINATION, răsh′ĭ-ŏs′ĭ-nā′shŭn, Psychology of. See Thought. For reasoning as a logical process, see Deduction; Induction; Syllogism.

RATION. See Rations.

RATIONALISM, răsh′ŭn-*al*-ĭz′m (Lat. *rationalis*, from *ratio*, reason). A term employed in philosophy and theology to denote a system in which the reason is supreme. In theology it is contrasted with supernaturalism and is used to describe a movement of thought which had its important representatives in Germany in the last half of the eighteenth century, but was to be found in England and elsewhere in the previous century in the earlier stages of development. According to one of its recent historians, Kahnis, it "makes the educated reason of the times the standard of all religious truth."

In philosophy the term is used to denote the doctrine that reason is an independent source of knowledge, distinct from sense perception and having a higher authority. In this sense it is opposed to sensationalism (q.v.). It is more widely used, however, for the view opposed to empiricism (q.v.) that in philosophy certain elementary self-evident concepts are to be sought and all the remaining content of philosophy deductively derived from them. This view was first explicitly stated by Descartes, developed by Spinoza and Leibnitz, and formulated by Wolff. Kant endeavored to transform rationalism by showing how reason was implicit in experience; and Hegel revived it in a transformed sense with the construction of experience itself as a system of reason.

Bibliography. W. E. H. Lecky, *History of the Rise and Influence of the Spirit of Rationalism in Europe* (London, 1865; new ed., 2 vols., ib., 1904); K. R. Hagenbach, *German Rationalism* (Eng. trans., Edinburgh, 1865); John Tulloch, *Rational Theology and Christian Philosophy in England in the Seventeenth Century* (London, 1872–74); Otto Pfleiderer, *The Evolution of Rationalistic Theology since Kant* (Eng. trans., ib., 1892); A. W. Benn, *History of English Rationalism in the Nineteenth Century* (2 vols., New York, 1906); J. B. Bury, *History of Freedom of Thought* (London, 1913). See also German Theology; Knowledge, Theory of.

RATIONS, rā′shŭnz; *in military usage, usually,* răsh′ŭnz (from Lat. *ratio*, reckoning, relation, reasoning). A ration is the allowance for the subsistence of one person for one day. A forage ration is the food allowance of one animal for one day. In the United States army the garrison ration (for persons) is intended for troops in garrison and in time of peace for troops in manœuvre camps; the ration to be issued to troops on the march in time of peace will be prescribed by the commander and will not exceed the allowances prescribed for the garrison ration; the travel ration is for troops traveling otherwise than by marching and separated from cooking facilities; the reserve ration is carried on the person of the men and in the trains and constitutes the reserve for field service; the field ration is the ration prescribed in orders by the commander of the field forces; the Filipino ration is for the use of the Philippine scouts; and the emergency ration is for troops in active campaign for use on occasions of emergency or in the field for purposes of instruction. The components of the principal rations and their net weights are as follows: Garrison ration: beef, 20 ounces; flour, 18; beans, 2.4; potatoes, 20; prunes, 2.8; coffee, 1.12; sugar, 3.2; milk, canned, 0.5; vinegar, salt, and pepper; lard, 0.64; butter, 0.5; net weight, 4.5 pounds; cost about 25 cents. Field ration: bacon, 12 ounces; hard bread, 16; beans, 4; tomatoes (canned), 10; prunes, 1.28; coffee, 1.12; sugar, 2.4; salt, 0.16; net weight, 3 pounds. The reserve ration is the simplest efficient ration and constitutes the reserve carried for field service. The components for this ration are: bacon, 12 ounces; hard bread, 16; coffee, 1.12; sugar, 2.4; salt, 0.16; net weight, about 2 pounds.

The emergency, or, as it is sometimes called, the iron ration, is a prepared food, carried in a sealed can, weight about 1 pound, and composed usually of chocolate, desiccated meat, and grain mixed. It is carried on the person and used only as a last resort, when no other food can be obtained.

The forage ration for the horse is 12 pounds of oats, 14 pounds of hay; for the mule, 9 pounds of oats, 14 pounds of hay. For the grain component may be substituted equal weights of barley or corn. On the march grain is the only forage carried, recourse being had to grazing if it is not possible to procure long forage in the country traversed.

Rations are carried in campaign as follows: 1. On each man, at least two days' reserve ration; for each draft animal, a reserve of one day's grain ration on each vehicle; on each cavalry and field-artillery horse, one feed. 2. In the ration section of the field train: for each man, two days' field, one day's reserve; for each animal, two days' grain rations. 3. In the supply train: two days' field and grain rations. Whenever possible, troops are supplied with fresh beef—preferably frozen beef sent up from the base, otherwise from herds of cattle driven with the supply train. Fresh or field bread is issued as often as possible, being supplied by the bakery companies attached to the line of communications. Army officers are not allowed rations.

In the United States navy the ration is not allowed to officers paid on the army basis, but for all others it is commuted to a cash payment of 30 cents a day. The enlisted force is furnished food in accordance with a fixed allowance table without regard to its cost, which is, however, about 30 cents a day, and this sum is allowed when the ration is commuted (i.e., paid in money). The navy ration as actually issued is a very liberal one. The average cost is 30 to 35 cents per day. While the allowance table is fixed in general terms, it gives the commanding officer and commissary a wide latitude in varying the character of the constituent parts. The supply of fresh meats and fresh vegetables is effected by means of the refrigerator and supply ships which accompany every fleet and detached squadron. All large ships and many small ones are fitted with refrigerator rooms large enough to hold several weeks' supply of refrigerated articles.

British soldiers have only one regular ration, which is the equivalent of the United States army garrison ration. It consists of three-quarters of a pound of meat and one pound of bread per day. In war time the meat ration is increased to one pound. The official value of the ration is sixpence (12 cents). All other food over this amount, and such articles as tea, coffee, sugar, butter, salt, pepper, etc., are bought by the soldier at his own expense. Fourpence per day is deducted from the soldier's pay, and from the fund thus raised the articles necessary are obtained. In time of war or on transports the government supplies all needed food and the soldier receives his full pay.

In the German army the same skill and refinement of detail that marks the entire army organization is brought to bear on the question of the soldiers' daily food, with a result that, while probably it is the most economical system in Europe, it is also one of the most excellent. The component parts are bread or zwieback, rice, bacon, fresh or canned meat, coffee, and salt. Japanese soldiers in time of peace receive a ration of rice, besides which they are allowed extra pay to cover the expense for meat, vegetables, and so on. The most scientific ration in the world is that of the Italian army; there are two regular rations, the garrison and the campaign. Consult: *Army Regulations of the United States Army* (Washington, 1913); *Field Service Regulation of the United States Army* (ib., 1914); *Organization Tables of the United States Army* (ib., 1914).

RA'TIO STU'DIO'RUM (Lat., scheme of studies). A code of rules which forms the basis for the guidance of Jesuit education, the full name of which is "Ratio atque Institutio Studiorum Societatis Jesu." See JESUITS.

RAT'ISBON. A city of Germany. See REGENSBURG.

RATISBON INTERIM. See INTERIM.

RATISBONNE, rȧ'tēs'bŏn', LOUIS GUSTAVE FORTUNÉ (1827–1900). A French author and critic, born in Strassburg and educated there and in Paris. He was one of the minor authors belonging to the Parnassian school (see PARNASSIENS). He resigned from the governmental employ on the declaration of the Empire, entered journalism, serving from 1853 to 1876 on the staff of the *Débats*, succeeded Feuillet as librarian at Fontainebleau, and in 1874 was appointed librarian to the Senate. Ratisbonne was the literary executor of Alfred de Vigny. His critical and literary studies included a metrical version of Dante's *Divina Commedia* (1854–59) and the essay *Henri Heine* (1885). But he was better known for his felicity as a poet of childhood, in such works as *Au printemps de la vie* (1857); *La comédie enfantine* (1860); *Les petits hommes* (1868); *Les petites femmes* (1871); various *Albums* under the pseudonym Trim; *Les grandes ombres* (1900).

RATI'TÆ (Neo-Lat. nom. pl., from Lat. *ratitus*, marked with the figure of a raft, from *ratis*, raft). A primary division of modern birds (Neornithes) based on the shape of the sternum, which is flat and without a keel. (See Plate ANATOMY OF BIRDS, accompanying the article, BIRD, Fig. 4.) The Ratitæ are a very small group of the most ancient lineage, now confined to the Southern Hemisphere. It includes the extinct groups Dinornithes (moas) and Æpyornithes (rocs), and the modern ostriches, rheas, emus, cassowaries, and kiwis. Except the kiwis, all are of very large size. The body is uniformly feathered (see PTERYLOSIS), and various anatomical features are characteristic. Naturalists are not agreed as to the precise relationships which exist between the Ratitæ and certain other groups, as, e.g., the Stereornithes (q.v.), but it is plain that the group is the most primitive of all those having existing representatives, and it is now generally believed that it represents a degenerate stage of descent from ancestral forms that were birds of flight. Consult: Hans Gadow, in Bronn's *Tierreich Aves* (Berlin, 1893); F. E. Beddard, *Structure and Classification of Birds* (London, 1898); A. H. Evans, "Birds," in *Cambridge Natural History*, vol ix (New York, 1900); and the authorities therein cited. See BIRD, FOSSIL; FLIGHTLESS BIRDS; and the names of various species of Ratitæ, as MOA, OSTRICH, ETC.

RATKE, rät'ke, WOLFGANG. See RATICHIUS.

RATNAGIRI, rŭt'nȧ-gē'rē. A district in the Territory of Concan (q.v.), British India.

RATON, rȧ-tōn'. A city and the county seat of Colfax Co., N. Mex., 25 miles by rail south of Trinidad, Colo., on the Atchison, Topeka, and Santa Fe and the Santa Fe, Raton, and Eastern railroads (Map: New Mexico, E 2). It is the centre of a stock-raising and farming region, which is also noted for its extensive coal deposits. There are large railroad repair shops here, the city being a division terminal of the Santa Fe line. Pop., 1900, 3540; 1910, 4539.

RAT PORTAGE. See KENORA.

RATRAM'NUS (sometimes incorrectly called BERTRAM, or BERTRAMUS). An Aquitanian monk and theologian of the early ninth century, connected with the monastery of Corbie, Picardy. He wrote, at the instance of Emperor Charles the Bald, a famous treatise, *De Corpore et Sanguine Domini*, a defense of the purely symbolical theory as to the Eucharist against a work of the same title by Paschasius Radbertus. In 1526 the work was brought into prominence through its being quoted by Bishop Fisher, of Rochester, as an exposition of the Roman Catholic doctrine regarding the Eucharist. Reprinted in 1527 at Cologne, it was much read by Protestants, and was placed on the *Index* by the Council of Trent. Subsequently it was defended within the Roman Catholic church by Sainte-Beuve and Jacques Boileau. Ratramnus also wrote *Contra Græcorum Opposita Romanam Ecclesiam Infamantium*, in defense of the whole system of Western dogma. The collected works may be found in Migne's *Patrologia Latina*, cxxi (Paris, 1844–64).

RAT-TAILED VIPER. See FER-DE-LANCE.

RAT-TAIL FISH. See GRENADIER.

RATTAN, răt-tăn', **RATAN,** or **ROTANG** (Fr. *rotin*, *rotang*, from Malay *rotan*, rattan), *Calamus*. A genus of about 200 species of mostly East Indian and tropical African palms with reedlike, slender, often jointed stems sometimes several hundred feet long. The name "rattan" is extended to other similar palms of the same tribe although placed by botanists in different genera. The stem, which is very smooth, hard, and siliceous externally, is either erect or ascends by means of hooked prickles at the extremities of the midribs of its leaves. It then descends in graceful festoons and may climb neighboring trees. All the species are useful, being much employed in their native countries for making bridges, plaited work, chair bottoms, rope, and so on, and are very largely exported, generally under the name of cane, for similar purposes. *Calamus rotang* and *Calamus rudentium*, occurring in India, Burma, Ceylon, and Malaysia, are among the most useful species. The walking sticks called Malacca canes are believed to be the produce of *Calamus scipionum;* the plant, however, does not grow in Malacca, but in Sumatra. The fruit of some species of rattan is used as food, and the young shoots, variously prepared, are used as vegetables. A very fine kind of dragon's blood (q.v.) is obtained from a species of rattan (*Calamus draco* or *Dæmonorops draco*), and particularly from the fruit, on the surface of which it appears as a resinous exudation. *Calamus acanthospathus* is one of the hardiest species, occurring as it does at elevations of 6000 feet in the Himalaya.

RAT′TANY. See Rhatany.

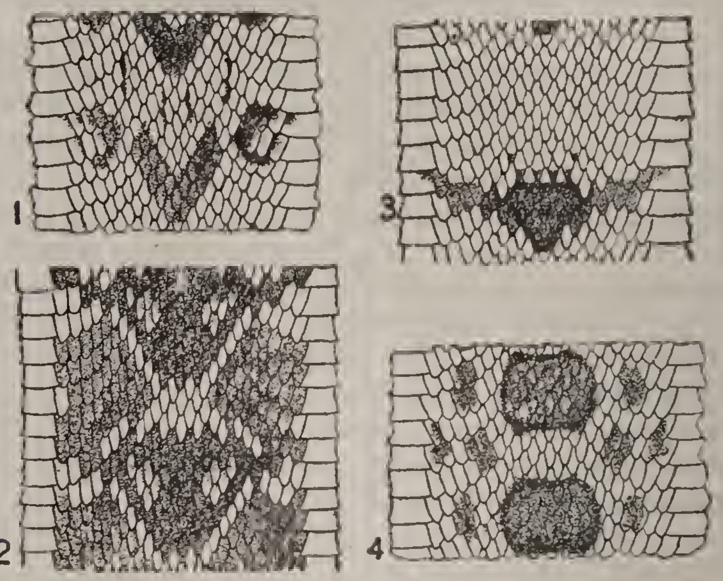
RATTAZZI, råt-tät′sē, Urbano (1808–73). An Italian statesman, born at Alessandria. He studied law at Turin and became an advocate at Casale. In 1848 he was elected a member of the Sardinian Parliament, and after sitting in the Casati cabinet was called into the ministry of Gioberti. He was one of those who urged Charles Albert into a continuance of the war with Austria in 1849, and after the defeat of Novara he was obliged to retire from the ministry. He became the leader of the Left Centre, or Moderate Radical party. In 1851, when Napoleon's coup d'état complicated foreign relations, an alliance was concluded between Cavour and Rattazzi, who had hitherto been opponents. Rattazzi took the portfolio of Justice in 1853, and subsequently that of the Interior in the Cavour ministry. He disagreed with Cavour on the French alliance and retired from the cabinet in 1858, but returned upon Cavour's resignation after the Peace of Villafranca. He was opposed to the surrender of Savoy and Nice to France, and he again retired in 1860. He returned to office in 1867, but his ambiguous attitude regarding Garibaldi's expedition against Rome in that year led to the downfall of his ministry in October. Consult: S. G., *Urbano Rattazzi* (Turin, 1861); *Lettres inédites du comte de Cavour au commandeur Urbain Rattazzi* (Paris, 1862); De Rute, *Rattazzi et son temps* (ib., 1881–87). An edition of his speeches, edited by Scovazzi, was published at Rome (8 vols., 1876–80).

RATTAZZI DE RUTE, råt-tät′sē de ro͞o′tå, Mme. de Solms-. See Bonaparte, Lætitia Marie Wyse.

RAT′TIGAN, Sir William Henry (1842–1904). An English lawyer, born in Delhi. He was educated at the High School, Agra, and at King's College, London, and was entered at the bar in 1873. He was additional member of the Supreme Legislative Council of India in 1892–93 and member of the Punjab Legislative Council in 1898–99, and at different times between 1880 and 1886 was judge of the Chief Court of the Punjab. He was knighted in 1895 and was returned to Parliament as member for Northeast Lanarks in 1901. His works include several standard works on Hindu law; *The Science of Jurisprudence* (1888; 3d ed., 1892); *Private International Law* (1895).

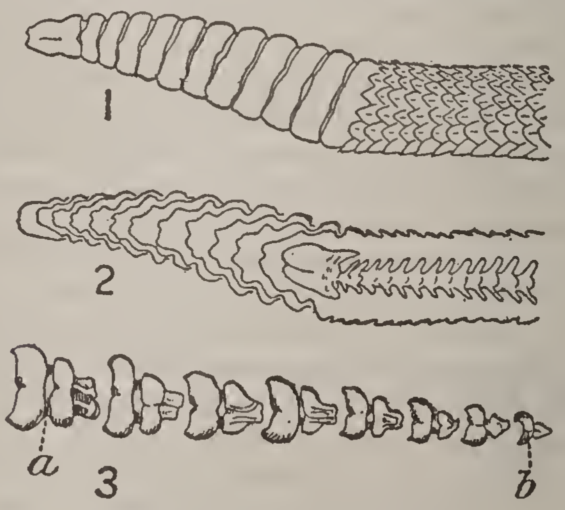
RATTLE POD. A species of *Crotalaria* (q.v.).

RAT′TLESNAKE′. An American venomous serpent of the family Viperidæ and subfamily Crotalinæ, distinguished from its congeners by a horny jointed appendage terminating the tail, the shaking of which causes a rattling noise likened to that of the ancient castanets or *crotala.* The Crotalinæ, until recently regarded as a family (Crotalidæ, pit vipers), stand at the head of the ophidian ranks as the "most specialized type of snake structure," and exhibit the "highest efficiency of the venom apparatus." They are viper-like serpents of moderate length—none exceeding and few approaching 8 feet—but thick, heavy, and extremely muscular. They are viviparous and mainly terrestrial; but one, at least (the moccasin), is decidedly aquatic, and several in Central and South America are arboreal. In colors they vary adaptively to their haunts. All are more or less distinctly marked with darker spots and patterns of squarish form. The group is predominantly American, but several species inhabit the East Indies, some of them belonging to the American genera *Ancistrodon* and *Lachesis.* The latter includes more than half of the 60 or so species of pit vipers recognized, and is mainly Neotropical. Among its species are the large and dangerous bush master and fer-de-lance (qq.v.). Among smaller genera one is *Teleuraspis,* a species of which (*schlegelli*) is arboreal and often winds around the stems at the centre of banana bunches, where it sometimes fatally bites the first man to handle the fruit. None of these have rattles. The true rattlesnakes, then, are only those pit vipers which belong to the genera *Sistrurus* (3 species) and *Crotalus* (15 species), all of which, except two species of *Crotalus* in South America, belong to the northern continent.



PATTERNS OF COLOR MARKINGS.

1, common Eastern banded rattlesnake (*Crotalus durissus*); 2, diamond rattlesnake (*Crotalus adamanteus*); 3, green rattlesnake (*Crotalus lepidus*); 4, plains rattler (*Crotalus confluentus*).

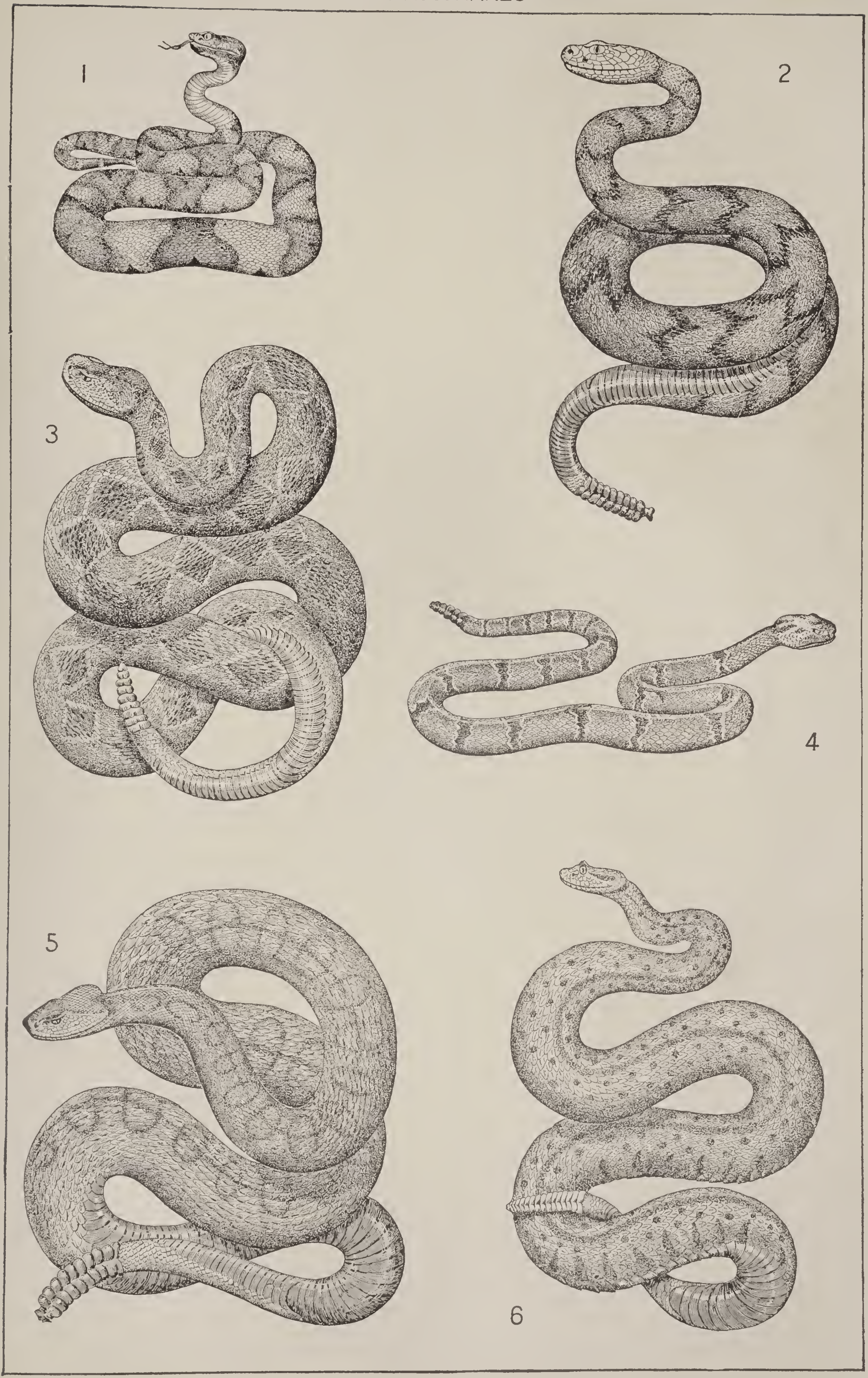


RATTLE OF A RATTLESNAKE.

1, perfect rattle of a large banded rattlesnake; 2, longitudinal section of rattle; 3, separate segments of disjointed perfect rattle of *Crotalus* (side view); *a,* basal "joint"; *b,* button.

The curious epidermal structure at the end of the tail consists of a tapering series of amber-colored horny flattened bells which are locked into one another. The oldest or terminal bell

RATTLESNAKES



1. COPPERHEAD (Ancistrodon contortrix).
2. EASTERN BANDED RATTLESNAKE (Crotalus durissus).
3. DIAMOND RATTLESNAKE (Crotalus adamanteus).
4. GREEN RATTLESNAKE (Crotalus lepidus).
5. PLAINS RATTLESNAKE (Crotalus confluentus).
6. HORNED RATTLER, or SIDEWINDER (Crotalus cerastes).

(the button) is in reality the horny covering of the tip of the tail which was not discarded when the skin was first molted. At each succeeding molt the tip is pushed out by the new skin, and so a bell is added at the base with each new shedding of the remainder of the skin. Theoretically these bells ought to indicate the number of moltings and the age of the snake; but wear and accident interrupt or break the set so often that the rule does not hold with any certainty.

When the serpent is excited in any way it vibrates its tail, which (unless the creature is moving) is then held upright in the centre of the coiled body, with the head erect and menacing before it. This vibration, which is indulged by many kinds of snakes under nervous excitement, produces a peculiar humming noise, which increases in intensity and pitch as the snake's alarm or anger and the speed of vibration are augmented, until it may sound like the droning of an angry bee. The origin of the rattle can only be guessed at. A tendency towards armature of the tail is apparent in several other genera of pit vipers; and in *Sistrurus* the rattle is much less well developed than in *Crotalus.* Apart from being a mere expression of emotion, the rattle serves to warn away cattle that might tread upon it or enemies that might wish to seize it. This warning is well understood among all the wild animals, but when antelopes and deer hear it they will often attack the reptile and cut it to pieces with their sharp hoofs. The rattle is also believed to be a useful means of calling the sexes together.

The poison apparatus, fangs (which are of the proteroglyphic type), and the manner and result of biting, are treated of under SNAKE. Here it needs only be said that, like the vipers generally, these snakes are sluggish and loath to bite when it can be avoided or when they are not surprised into a sudden stroke. This disposition varies, however, with the weather, their hunger, the season (all are irritable when sloughing their skin), and it differs in various species. Even the smallest may cause a man serious illness and perhaps death if it succeeds in introducing much poison into a wound; while a fairly delivered bite from the larger ones is almost certain to prove fatal. Its enemies are mainly confined to a few of the larger colubrine snakes, as the black snake, king snake, and the like; to the pronghorn, Western deer, and Southern peccaries. Against man the rattlesnakes can make feeble resistance. Domestic pigs kill and eat as many as they can find, and rarely suffer harm, because of the thickness of the skin and the layers of fat underneath it, which prevent the fangs from entering or carrying venom to the system. Hunting of rattlesnakes affords occasional profit to a few persons, who find a market for their skins and for the clear smooth oil yielded by their fat, which is esteemed by watchmakers and gunsmiths and is in demand as a medicine among the ignorant.

The most common and well known of the rattlesnakes is that one (*Crotalus durissus*, or *horridus*) formerly abundant all over the East, from the White Mountains in New Hampshire and Lake Superior in the North to the borders of the dry plains. It is larger in the Southern States than northward, and occasionally reaches a length of 5 feet, with a diameter in that case of 4 to 5 inches. The ground color above varies from bright tawny to dark brown. A light line runs from the mouth to the eye, with a dark patch below; and the body is marked with three rows of confluent irregular brown spots, forming about 21 zigzag crossbars. The head is oval in outline. This snake inhabits wooded regions, avoiding prairies. It is especially fond of rocky districts, and hence is most numerous among mountains, where it is inclined to gather in considerable numbers in certain holes and caverns in the autumn, in order to undergo the winter sleep in closely entwined companies. About nine young are born annually in midsummer. The Southern States have a still larger species known as the diamond rattlesnake (*Crotalus adamanteus*) on account of the rhomboidal black blotches, each perfect in all its angles and edged with yellow, which ornament its yellowish body. This snake sometimes reaches, on the Mangrove Islands of western Florida, a length of 8 feet, and has so great a thickness that large individuals may be regarded as the most bulky of all venomous snakes, for the Oriental cobras, although sometimes longer, are far more slender. The range of the diamond rattlesnake extends along the coast from North Carolina to Texas, and a variety ranges westward to Lower California. Two other similar and almost equally large and dreadful snakes are *Crotalus molossus* and *basiliscus.* Southern California also has a remarkable species (*Crotalus ruber*), which has an oblong head and whose markings are deep red or sometimes chestnut upon a paler reddish ground. The rattlesnake of the plains (*Crotalus confluentus*) is a light-colored, obscurely marked, rather small species. It is highly variable in form and color, and is the kind constantly found in prairie-dog towns. Several other species occur in the Rocky Mountain region and northern Mexico, one of which, the horned rattlesnake (*Crotalus cerastes*), is the characteristic snake of the deserts of the Rio Colorado and Gila, where the people call it sidewinder, from its habit of progressing sidewise instead of in the usual way. It takes its specific name from the fact that the plates above the eyes are thickened into hornlike cones, sometimes of considerable height. It is not of large size, but is dangerous because of the virulence of its poison.

The small, active prairie rattlesnakes, now greatly reduced in number, differ sufficiently from the genus *Crotalus* to be set apart into the genus *Sistrurus.* One of them (*Sistrurus miliarius*) is the ground rattler of the Southern States, too frequently met with in stubble fields and grassy places. A Northern congener is the black rattlesnake or massasauga, once common between the Alleghany Mountains and the plains, but now nearly exterminated except on the frontier. This species (*Sistrurus catenatus*) may reach a length of 30 inches, and is brown, with a series of darker brown transverse spots on the back, beneath each of which is a small brown spot, forming a linear series along the sides. Its rattle is small, but can be heard at a considerable distance, and its bite is likely to be exceedingly troublesome to men and domestic animals, although not often fatal. These snakes prefer low, wet ground, the draining of which by the spread of farming operations has been the principal agency in its decrease.

Consult: H. C. Bumpus, in *Standard Natural History*, vol. iii (Boston, 1885); L. H. Stejneger, "Reptiles of Death Valley," in *North American Fauna, No.* 7 (Washington, 1893); id., "Poisonous Reptiles of the United States," in

Annual Report United States National Museum for 1893 (ib., 1895); E. D. Cope, *Crocodilians, Lizards, and Snakes of North America* (ib., 1900); R. L. Ditmars, *The Reptile Book* (new ed., New York, 1914). See SNAKE, and Plate of RATTLESNAKES.

RATTLESNAKE MASTER. See ERYNGO.

RATTLESNAKE PIKE. See SAUGER.

RAT′TLEWING′, or WHISTLEWING. The golden-eye duck. See GOLDEN-EYE.

RATTRAY, răt′rā, WILLIAM JORDAN (1835–83). A Canadian journalist and author. He was born in London, England, but in 1848 went to Canada with his parents, who settled in Toronto. He graduated with high honors at Toronto University in 1858 and entered journalism, later becoming an editorial writer on the Toronto *Mail.* Besides writing for that newspaper much that was excellent on political and social topics, Rattray contributed to its Saturday issue a series of articles, extending over several years, in which orthodox Christianity was defended against agnosticism and materialism. He had a finished and trenchant style and his writings were widely influential. He contributed also to the *Canadian Monthly* and other periodicals. He published *The Scot in British North America* (1883).

RATZEBURG, rät′se-burk, JULIUS THEODOR (1801–71). A German entomologist. He was born and educated in Berlin, where in 1828 he became privatdocent at the university. Two years afterward, upon the removal of the Berlin Forestry School to Eberswalde, Ratzeburg became its professor of natural science; he resigned in 1869. By his work there as a teacher and his publications, he ranks as the founder of the scientific treatment of entomology as related to forestry. Among his more important writings are: *Die Forstinsekten* (1837–44; 2d ed., 1885); *Die Waldverderber und ihre Feinde* (1841; 8th ed., 1885); *Die Ichneumonen der Forstinsekten* (1844–52); *Waldverderbnis durch Insektenfrass* (1866–68); some botanical treatises; and a *Forstwissenschaftliches Schriftsteller-Lexikon,* completed by Acherson and containing an autobiography (1874).

RATZEL, rät′sel, FRIEDRICH (1844–1904). A German geographer and traveler, born at Karlsruhe and educated at Karlsruhe, Heidelberg, Jena, Berlin, and elsewhere. As correspondent of the *Kölnische Zeitung* he traveled in 1869 in Italy, Sicily, and southern France, and in 1872–75 in the United States, Mexico, and Cuba. In 1876 he became professor of geography at the Polytechnic School of Munich, and in 1886 was appointed to a similar position at the University of Leipzig. Ratzel performed the great service of placing anthropogeography on a secure scientific basis. Among his printed works are: *Sein und Werden der organischen Welt* (1868); *Wandertage eines Naturforschers* (1873–74); *Vorgeschichte des europäischen Menschen* (1875); *Städte- und Kulturbilder aus Nordamerika* (1876); *Die Vereinigten Staaten von Nordamerika* (1878–80); *Die Erde* (1881); *Völkerkunde* (1886–88; 2d ed., 1894); *Die Erde und das Leben* (1901–02). With Schweinfurth he edited Emin Pasha's letters of travel and reports (Leipzig, 1888).

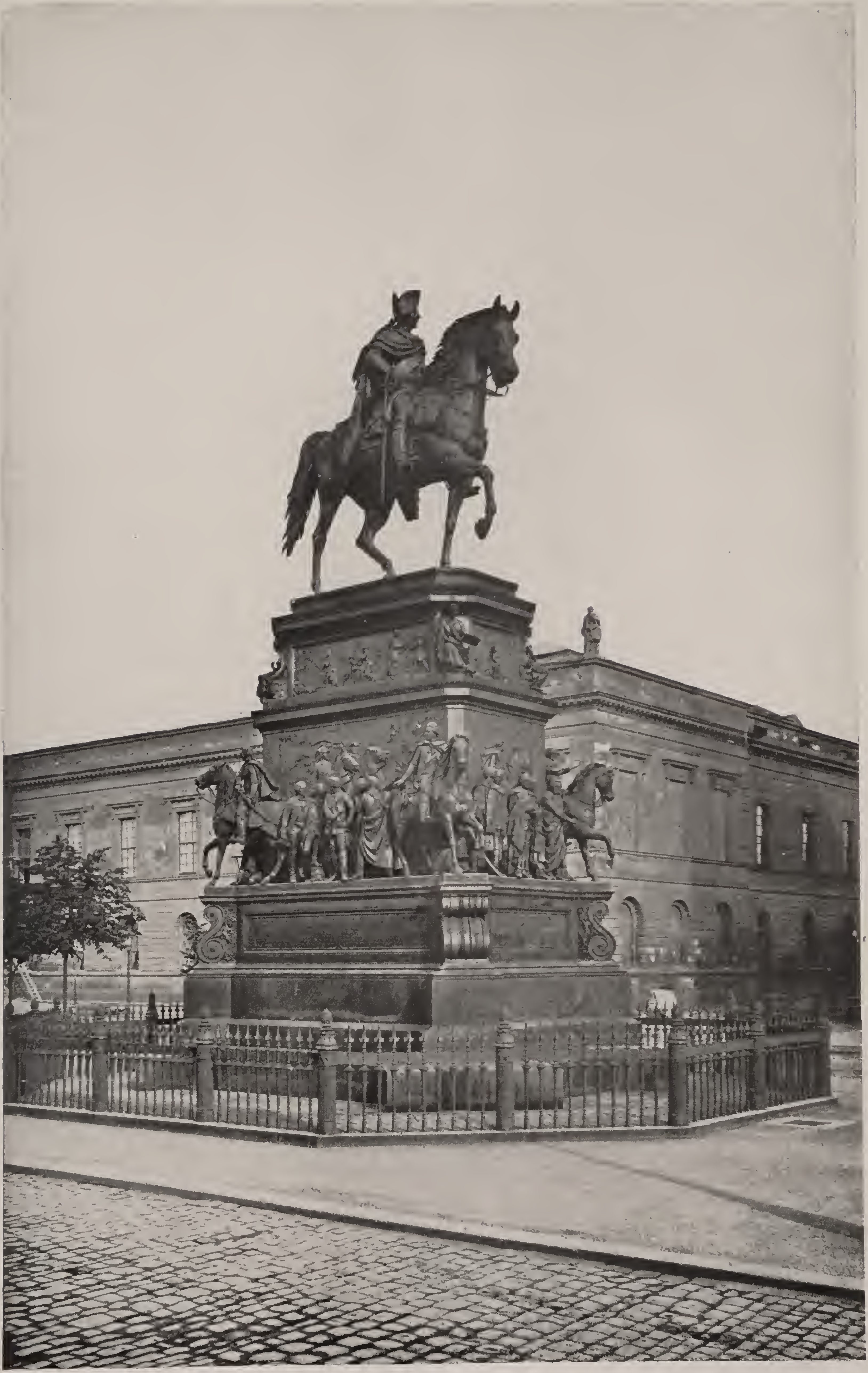
RAU, rou, KARL HEINRICH (1792–1870). A German economist, born at Erlangen. He studied at the University of Erlangen, where he became privatdocent in 1812, professor extraordinary in 1816, and in 1818 full professor of political economy. In 1822 he was called to the chair of political economy at Heidelberg University. His principal works are: *Ueber das Zunftwesen und die Folgen seiner Aufhebung* (1816); *Grundriss der Kameralwissenschaft und Wirtschaftslehre* (1823); *Lehrbuch der politischen Oekonomie* (1826–37). In his *Lehrbuch,* which was long considered the classical German work on economics, he adopts the general position of Adam Smith and Say, but retains a tendency to advocate the extension of the economic functions of the state. He founded in 1835 the *Archiv der politischen Oekonomie und Polizeiwissenschaft.*

RÄUBER, roi′bĕr, DIE (Ger., The Robbers). An early play of Schiller (1781), which, with many imperfections, attained great success.

RAUCH, rouk, CHRISTIAN DANIEL (1777–1857). The most celebrated German sculptor of the early nineteenth century. He was born Jan. 2, 1777, at Arolsen in the Principality of Waldeck. His father was employed at the court of Prince Frederick II of Hesse, and in 1790 the lad was apprenticed to the court sculptor Valentin at Arolsen; in 1795 he became assistant to Ruhl, court sculptor at Cassel. On the death of his father in 1797 Rauch abandoned sculpture temporarily and entered the personal service of King Frederick William III of Prussia. Studying at odd moments, he came under the influence of Johann Gottfried Schadow; in 1802 he exhibited his first statue, a "Sleeping Endymion and Artemis," and in 1803 his bust of Queen Louise. In 1804 he went to Rome, provided with a small stipend. During his six years' stay at Rome his art was chiefly influenced by Thorvaldsen and by the antique. Among these early works were reliefs of "Hippolytus and Phedra," "Mars and Venus Wounded by Diomedes," and busts of the King of Prussia and Queen Louise, besides others executed by order of the King of Bavaria for the Walhalla.

In 1818 he was summoned to Berlin by the King and given the commission for a monument to Queen Louise in the royal mausoleum at Charlottenburg. The marble statue of the Queen reclines on a simple sarcophagus. This work, one of the most interesting in modern German sculpture, gave Rauch a European reputation. A similar statue of the Queen, even more successful, was placed in the park of Sans Souci at Potsdam. While engaged upon his works he found time to model numerous excellent portrait busts, among the best of which are those of Dürer (1837, Walhalla), of Thorvaldsen for the King of Denmark, and a colossal bust of Goethe (1820). In 1819 he established a royal atelier of sculpture in Berlin, and assisted Schinkel in his scheme for the museum, which was finished in 1830.

A projected statue of Goethe for Frankfort was modeled, but not executed, though a statuette of the poet in his study gown is well known. Rauch made an interesting series of bronze statues of German heroes of the Napoleonic wars, the best of which are at Berlin and at Breslau. Other important works are: the monument of the two Polish princes Mieczislaw and Boleslaw, in the cathedral of Posen (1840); the statue of Albrecht Dürer in Nuremberg (1840); the Max Joseph monument in Munich (1833); the gable group and six smaller Victories for the Walhalla near Regensburg. His greatest work is the immense bronze monument of Frederick the Great in Berlin (1839–51). A colossal equestrian statue of the King surmounts a pedestal, about



RAUCH
STATUE OF FREDERICK THE GREAT IN BERLIN

the base of which are groups of generals and soldiers and bas-reliefs representing scenes in the life of Frederick. Rauch's works combined, to a remarkable extent, natural truth with ideality of character, and he succeeded in the difficult task of adapting modern costume to the ideal portrait representation. He was the founder of the Berlin school of sculpture, the most important in Germany, and in which his spirit yet prevails. Consult Friedrich Eggers, *Christian Daniel Rauch* (4 vols., Berlin, 1873–87), the leading biography, upon which E. D. Cheney's *Life* (Boston, 1893) is based; Dobbert, *Rauch* (Berlin, 1877); Karl Eggers, *Rauch und Goethe: urkundliche Mittheilungen* (ib., 1889); id., *Rauch, Leben und Werke* (ib., 1891), for illustrations; also Merckle, *Das Denkmal König Friedrich des Grossen* (Berlin, 1894).

RAUCOURT, rȯ̆'kōōr', Mademoiselle (1756–1815). A French actress, whose real name was Françoise Saucerotte. She was born at Nancy. At the age of 12 she made her début in Spain under her actor father, in 1770 played at Rouen, and in 1772 appeared at the Comédie Française, Paris, as Dido. Under the patronage of the Queen she was seen in 1779 at the Théâtre Française, where she reappeared in 1793 and 1799, after being in prison during the Revolution. Under the Empire she toured Italy with her own company. When the Paris clergy refused to give burial to the body of Mademoiselle Raucourt, whose private life had been scandalous, a crowd broke into the church and Louis XVIII had to send an almoner to officiate.

RAUHES HAUS, rou'*e*s hous. One of the earliest industrial institutions for poor boys, founded by Wichern at Horn, near Hamburg, Nov. 1, 1833, in an old house called by its former occupant Ruges Hus, which by a mistranslation into High German became Rauhes Haus. The inmates live in groups of 12 or 15, under the charge of a brother. The scope of the school has widened with its growth and now comprises: (1) Department for neglected children, who receive a common-school education and are trained for handwork and later on are apprenticed or employed in the institution. (2) Department for trades instruction. (3) Boarding department for boys of better families. (4) A training school, begun in 1845, for workers in charitable societies and institutions. The men are called brothers, and most of them have found service under the Inner Mission (q.v.). (5) Book department, including a printing office, started in 1844. The oversight and care of the children fall largely on the assistants, who are training for work in other institutions.

RAUMER, rou'mẽr, Friedrich Ludwig Georg von (1781–1873). A German historian, brother of Karl Georg von Raumer, born at Wörlitz, near Dessau. He studied at Berlin, Halle, and Göttingen, and held government appointments from 1806 to 1811. In the latter year he was made professor of political science at Breslau and in 1819 was called to Berlin. He traveled widely between 1827 and 1843 and published his observations. He was a member of the German National Assembly of 1848–49 at Frankfort. Subsequently he became a member of the Upper House of the Prussian Diet. His more important works are: *Geschichte der Hohenstaufen und ihrer Zeit* (1823–25; 5th ed., 1878), a standard work on that period; *Ueber die geschichtliche Entwickelung der Begriffe von Recht, Staat und Politik* (2d ed., 1826); *Geschichte Europas seit dem Ende des 15. Jahrhunderts* (1832–50); *Beiträge zur neuern Geschichte aus dem Britischen Museum, etc.* (1836–39); *Die vereinigten Staaten von Nordamerika* (1845); *Antiquarische Briefe* (1851); *Handbuch zur Geschichte der Litteratur* (1864–66). With F. A. Brockhaus he founded in 1830 and until 1867 also edited the *Historisches Taschenbuch.*

RAUMER, Karl Georg von (1783–1865). A German geologist and educator, born at Wörlitz, brother of F. L. G. von Raumer. After studying at several German universities and at the mining academy at Freiberg, in 1811 he became professor of mineralogy at Breslau. Raumer took part in the wars of 1813–15, and subsequently taught at Halle (1819–23), in the Dittmar training school, Nuremberg, and, as professor of natural history, at Erlangen (after 1827). Among his works are: *Geognostische Fragmente* (1811); *ABC-Buch der Kristallkunde* (1820–21); *Lehrbuch der allgemeinen Geographie* (1832; 3d ed., 1848). On education he wrote an important *Geschichte der Pädagogik* (1843–51; 6th ed., 1890–98; Eng. trans.).

RAUPACH, rou'päG, Ernst Benjamin Salomo (1784–1852). A German dramatist. He was born at Straupitz, Silesia, studied theology at Halle, was for 10 years tutor in Russia, and was subsequently (1816) appointed professor of philosophy, German literature, and history in the University of St. Petersburg. Raupach left Russia in 1822 and, after a visit to Italy, settled in Berlin, where he devoted the remainder of his life chiefly to writing for the stage. His facility was remarkable, and he wrote in all about 80 plays, besides letters and poems. Among his early pieces the following are noteworthy: *Die Gefesselten* (1821); *Die Freunde* (1825); *Isidor und Olga* (1826). Among his comedies may be mentioned *Die Schleichhändler, Der Zeitgeist,* and the farces *Denk' an Cäsar* and *Schelle im Monde.* Of his posthumous works are: *Der Kegelspieler* (1853); the tragi-comedy, *Mulier Taceat in Ecclesia* (1853); *Saat und Frucht* (1854). The popular drama *Der Müller und sein Kind* still holds the stage. He collected his earlier plays in two volumes, *Dramatische Werke komischer Gattung* (1829–35) and *Dramatische Werke ernster Gattung* (1830–43). Consult Pauline Raupach, *Raupach: eine biographische Skizze* (Berlin, 1853).

RAUSCHENBUSCH, rou'sh*e*n-bụsh, Walter (1861–). An American Baptist theologian and writer. He was born at Rochester, N. Y., where he graduated from the university (1884) and the theological seminary. His preparatory education he had received at the Classical Gymnasium of Gütersloh, Germany, and again in 1891–92 and 1907–08 he studied abroad. From the year of his ordination (1886) to 1897 he was engaged in religious work among German immigrants in New York City. Thereafter he was connected with the Rochester Theological Seminary, becoming professor of Church history in 1902. Dr. Rauschenbusch served as Earl lecturer at the University of California (1910), as Merrick lecturer at Ohio Wesleyan in 1911, and as Gates lecturer at Grinnell College (1914). His *Christianity and the Social Crisis* (1907) and *Christianizing the Social Order* (1912; Norw. trans.) were of wide influence. Among his other writings are: *Das Leben Jesu* (1895); *Leben und Werken von Augustus Rauschenbusch* (his father) (1901); *The New Evangelism* (1904); *For God and the People: Prayers of the Social*

Awakening (1910); *Unto Me* (1912); *Dare We Be Christians?* (1914).

RAVAILLAC, rȧ′vȧ′yäk′, François (1578–1610). The assassin of Henry IV of France. He was born at Angoulême. He joined the Order of Feuillants in Paris, but was expelled as a visionary fanatic and then became inspired with hatred of the Huguenots and determined to kill the King. On May 14, 1610, as the King was passing in his coach through the narrow street of Laferronnerie, Ravaillac climbed upon the right rear wheel of the carriage at the moment that its advance was hindered by a heavy wagon, and leaning forward he plunged a knife into the breast of the King. Ravaillac escaped in the confusion, but was soon captured, admitted his guilt, and after a formal trial was put to death in the Place de Grève, May 27, being torn asunder by horses. He steadily refused to say whether he had accomplices. Both Martin and Poirson have examined the case against Ravaillac with care and have come to the conclusion that the real cause was fanaticism which had degenerated into monomania. Consult: B. L. H. Martin, *Histoire de France* (4th ed., Paris, 1855–61); Auguste Poirson, *Histoire du règne de Henri IV* (2 vols., ib., 1857); J. A. J. Loiseleur, *Ravaillac ct ses complices* (ib., 1873).

RAVAISSON-MOLLIEN, rȧ′vȧ′sôɴ′-mô′lyăɴ′, Jean Gaspard Félix (1813–1900). A French philosopher and archæologist, born at Namur. He was educated at the Collège Rollin and at Munich. In 1838 he received his doctor's degree and was appointed professor of philosophy at Rennes. Ravaisson became inspector general of public libraries in 1840, was inspector general in the department of higher education from 1859 to 1888, and was elected a member of the Académie des Inscriptions (1849) and of the Académie des Sciences Morales et Politiques (1880). His works include: *De l'habitude* (1838); *Rapport sur le stoicisme* (1851); *La philosophie en France au XIXe sièclc* (1868; 3d ed., 1889); *La Vénus de Milo* (1871); *Morale et metaphysique* (1893). His articles on archæology appeared in the *Revue Archéologique* and in the *Mémoires* of the Académie des Inscriptions.

RAVELIN, răv′lĭn. See Fortification.

RA′VEN (AS. *hræfn*, OHG. *hraban*, *raban*, Ger. *Rabe*, raven; perhaps connected with OPruss. *kracco*, black woodpecker, Lat. *corvus*, Gk. *κόραξ*, *korax*, raven, Lat. *cornix*, Gk. *κορώνη*, *korōnē*, crow, Skt. *karava*, raven, and with Lat. *crocire*, OChurch Slav. *krakati*, to croak, as well as with OHG. *hruoh*, AS. *hroc*, Eng. *rook*). The largest of corvine birds (*Corvus corax*), a species of crow usually more than 2 feet in length. The feathers on the neck are long, narrow, and pointed, forming a ruff; the bill is strong, compressed, sharp, somewhat hooked, and surrounded at the base with feathers and bristles. The wings are long and powerful; the color is uniform black, lustrous in the male, and although this bird is nowhere migratory, even enduring winter in the Arctic regions, it never turns white at that season, as do most Arctic animals. The raven was originally to be found in almost all parts of the Northern Hemisphere, but is now nearly or quite extinct east of the high central plains, though still numerous in the western half of the United States and in northwestern Canada. It goes about alone or in pairs and is one of the most omnivorous of birds, feeding on fruits and nuts, insects, worms, mollusks, birds' eggs and fledglings, and small mammals. It rejoices in carrion and not infrequently attacks weak or sickly beasts, almost invariably choosing their eyes as its first point of assault. It makes its nest of sticks, coarse weeds, wool, hair, and the like, on a narrow ledge of a precipice or in some similarly inaccessible situation, usually as early as February. The eggs are green, thickly marked with dark streaks and blotches. (See Plate of Eggs of Song Birds.) Ravens are occasionally captured when young and become interesting pets. By nature they are impudent, cunning, inquisitive, and mischievous. They destroy everything that can be destroyed, apparently with real pleasure, and they will steal anything they can carry off, particularly glittering things. Moreover, they have considerable power of imitating human speech. Newton and others regard the raven as the most highly developed mentally and physically of all birds. It is celebrated for its longevity, and instances are on record of its living 70 or 80 years. In the southwestern United States a crowlike bird is found, the white-necked raven (*Corvus cryptoleucus*), with the neck feathers of a raven, but with bases pure white. Several other species are known in various parts of the world. Consult Alfred Newton, *Dictionary of Birds* (New York, 1896), and authorities therein cited. Cf. Crow; Jackdaw; and see Plate of Jays, Magpies, etc.

RAV′ENA′LA. A Madagascar plant. See Traveler's-Tree.

RAV′ENEL′, Henry William (1814–87). An American botanist, born in St. John's Parish, Berkeley Co., S. C. He graduated from South Carolina College, Columbia, in 1832, became a planter in St. Johns, and then went to Aiken, S. C., in 1853. He made a special study of the flowering plants of South Carolina and various groups of fungi. The genus *Ravenelia* of the Uredineæ is named after him. His works include *Fungi Caroliniani Exsiccati* (5 vols., 1853–60) and *Fungi Americani Exsiccati* (8 vols., 1878–82), with M. C. Cooke.

RAVENNA, rȧ-vĕn′nȧ. The capital of the Province of Ravenna, in the Compartimento of Emilia, Italy, situated on a marshy, unhealthful plain between the Lamone and the Fiumi Uniti, 6 miles from the Adriatic and 45 miles by rail east by south of Bologna (Map: Italy, D 2). Ravenna, connected with the sea by a canal, is surrounded by old bastions and low walls, where may still be seen the iron rings to which the cables of ships were formerly fastened when the city was a seaport. It lies in a compact form. On the outskirts are extensive parks and pleasure grounds. In the centre of the town is the Piazza Vittorio Emanuele, with two high columns erected in 1483 by the Venetians and bearing the statues of Sts. Vitalis and Apollinaris. The streets are wide, and the squares are adorned with interesting statues, but the houses present a gloomy appearance, and the place, in its stillness, has a rather depressing effect on the visitor. With its basilicas Ravenna is highly important in the history of Christian art from about 400 to 800, the Byzantine and the early Christian forms of architecture being here abundantly illustrated and suggestively united in the ancient churches. The basilicas here differ in many respects from those of Rome. Their interiors manifest also Ravenna's prominence in mosaic painting. The cathedral of Sant' Orso was rebuilt in 1734 and is of no great interest. Its ivory throne of St. Maximian, its

"Elijah" by Guido Reni, and the ornamentation of animals and foliage are, however, valued. The fine octagonal baptistery adjoining, supposed to be part of a Roman bath, was largely reconstructed after 1865. The interior is embellished with statues and with the oldest (fifth century) of the rare mosaics of Ravenna, one of which here represents the baptism of Christ. The interesting church of San Vitale, situated where the saint was martyred, was consecrated in 547. It is octagonal. Its choir is embellished with rich mosaics. Charlemagne patterned the cathedral at Aix-la-Chapelle after this church. In the vicinity is the noteworthy mausoleum of Galla Placidia, now the San Nazario e Celso, begun in the middle of the fifth century by that Empress. Many of the earliest buildings in Ravenna are due to Galla Placidia and her brother Honorius. These structures form, in fact, the unique period of its religious architecture. The interesting basilica of Sant' Apollinare Nuovo, containing elaborate mosaics, was built by Theodoric as an Arian church. Adjacent to the church of San Francesco is the tomb of Dante. It was reconstructed in 1780. His remains, which were kept hidden until 1865, are now inclosed in a marble urn. Another noteworthy church is the large Sant' Apollinare in Classe Fuori, dating from 535 and restored in 1779.

In the northeast portion of Ravenna stands the old city castle, the Rocca di Brancaleone, of Venetian origin and partly demolished in 1735. Still farther northeast is the mausoleum of Theodoric the Great, called the Rotonda, decagonal in shape, with a flat roof. A part of the palace of Theodoric, architecturally as well as historically of great interest, is still to be seen, together with a porphyry basin which is designated as the King's coffin. The archiepiscopal palace, decorated with excellent mosaics, was restored in the sixteenth century. The Academy of Fine Arts, founded in 1827, has nothing of great note. The Byzantine Museum contains sculptures, fragments of architecture, etc. The former monastery of Classe, dating from 1515, holds the municipal collections. The communal library, dating from 1707, has about 75,000 volumes and 800 manuscripts, including several very precious ones. Ravenna is intimately associated with the lives of Dante and Lord Byron. They made famous the ancient pine forest which extends many miles along the coast to the southeast. Directly south of the city rises the column of Gaston de Foix, who on April 11, 1512, defeated the Spanish and papal forces here and fell in the moment of victory. The principal industries are the cultivation of the vine, the spinning and weaving of silk, and the manufacture of wine, glass, leather, laces, bricks, musical instruments, and agricultural implements. A large fair is held in May. The commerce is in cereals, wine, fruits, rice, and fish. The population of Ravenna (commune) was, in 1901, 64,031; in 1911, 71,581; in 1914 (est.), 73,393.

History. Ravenna is one of the oldest towns in Italy. In Augustan times the Roman Adriatic fleet was stationed here and there was considerable commerce. In 404 the Emperor Honorius made this, then a city on the sea, his abiding place because it was well defended. Some years later it became an archiepiscopal see. Ravenna attained its distinctive prominence after the fall of the Roman Empire. It was seized by King Odoacer and passed (493) into possession of the Ostrogoth Theodoric and became a magnificent seat of royal power. It was taken by Belisarius in 539 and was a place of official importance under the Greek emperors until 752 (see RAVENNA, EXARCHATE OF); it was next ruled by the Lombards. It soon fell into the hands of Pepin the Short, who turned it over to the papal sway. Late in the thirteenth century it fell under the sway of the Polenta family. In 1441 it became subject to Venice, under whose régime it prospered greatly. In 1509 it was taken by Pope Julius II, and it remained a papal possession until 1797. After being under French control for 17 years it was restored to papal dominion by the Congress of Vienna and became a part of the Italian Kingdom in 1857.

Bibliography. A. F. V. Quast, *Die altchristlichen Bauwerke von Ravenna* (Berlin, 1842); Charles Diehl, *Ravenne, études d'archéologie byzantine* (Paris, 1885); Ferdinand Gregorovius, "Von Ravenna bis Mentana," in *Wanderjahre in Italien*, vol. iv (5th ed., Leipzig, 1892); Walter Goetz, *Ravenna* (ib., 1901); Allen and Williamson, *Cities of Northern Italy*, vol. ii (Boston, 1906); Charles Diehl, *Ravenne* (Paris, 1907); P. D. Pasolini dall' Onda, *Ravenna e le sue grandi memorie* (Rome, 1912); Theodor Gsell-Fels, *Oberitalien und Mittelitalien* (9th ed., Leipzig, 1912); E. H. and E. W. Blashfield, in *Italian Cities* (New York, 1912).

RAVEN'NA. A city and the county seat of Portage Co., Ohio, 35 miles by rail southeast of Cleveland, on the Erie, the Pennsylvania, and the Baltimore and Ohio railroads (Map: Ohio, H 3). There are manufactories of coaches and hearses, chairs, iron goods, electrical supplies, furnaces, worsted goods, etc. Pop., 1900, 4003; 1910, 5310.

RAVENNA, EXARCHATE OF. The designation of that part of Italy which was under the rule of the Byzantine emperors from 568 to 752. The capital of the governor, or exarch (q.v.), was at Ravenna, and for a short time he ruled over the whole of Italy. When in 568 the Lombards began to invade Italy, which had been conquered by Narses (q.v.) in 553, the old Roman names and divisions rapidly disappeared, and new ones arose. A high military functionary, the exarch, was sent from Constantinople to resist the barbarians, the first one being appointed some time between 572 and 584. The Lombards soon conquered large portions of Italy, so that the various parts of the exarchate were no longer conterminous, there being finally seven separate strips of territory, the chief of which, situated about Genoa and known as Liguria, was taken by the Lombards in 640. In 752 Aistulf, King of the Lombards, captured Ravenna, and the exarchate ceased to exist. The government of the exarch was always a military one and almost independent of all control, owing to the difficulty of communication with Constantinople. The name exarchate continued to be used for the territory around Ravenna, which had been given to the papacy by Pepin in 755, as late as the twelfth century. Consult Charles Diehl, *Etudes sur l'administration byzantine dans l'exarchat de Ravenne* (Paris, 1888), and Hartmann, *Untersuchungen zur Geschichte der byzantinischen Verwaltung in Italien* (Leipzig, 1889).

RAVENNA, GUIBERT, or WIBERT, OF. See GUIBERT OF RAVENNA.

RAVENSBURG, rä'vens-bụrk. A town in Württemberg, Germany, situated in a fertile valley, on the Schussen, 52 miles by rail south by west of Ulm (Map: Germany, C 5). It is mediæval in appearance, possessing a fine sixteenth-century town hall. The leading industries are the spinning and weaving of woolen and linen fabrics. Ravensburg, founded in the eleventh century by the Guelphs, became a free Imperial city in 1280. It belonged to Bavaria from 1803 to 1810, when it passed to Württemberg. Pop., 1900, 13,444; 1910, 15,594.

RA′VENSCROFT, Edward (fl. 1671–97). An English dramatist, best known for his polemic with Dryden. His plays were remarkably successful translations or remodelings of the plays of others, notably Molière and Thomas Corneille. In *The Canterbury Guests* (1694) Ravenscroft actually composed a play almost entirely from his own previous work.

RAVENSCROFT, Thomas (1593–c.1635). An English composer. He was born near London, received his musical education in St. Paul's choir, and had the degree of bachelor of music conferred on him in 1607. In 1611 appeared his *Melismata, Musicall Phansies,* etc., a collection of 23 part songs, some of them of great beauty; and three years later he brought out another collection of part songs under the title of *A Brief Discourse,* an essay on the old musical modes. Turning his attention to psalmody, he published in 1621 a collection of psalm tunes for four voices entitled *The Whole Book of Psalms, Composed into Four Parts by Sundry Authors to Such Tunes as Have Been, and Are Usually Sung in England, Scotland, Wales, Germany, Italy, France, and the Netherlands.* This was the first publication of its kind, and innumerable similar works of subsequent date have been largely indebted to it. Each of the 150 psalms has a distinct melody assigned it. Two collections of secular songs similar to the *Melismata,* and entitled *Pammelia* and *Deuteromelia,* have been assigned to Ravenscroft, but it is probable that only a few of these songs were composed by him, while he may have revised and edited the whole. A selection from his works was printed by the Roxburgh Club in 1822.

RAVENSTEIN, rä′ven-stīn, Ernst Georg (1834–1913). An English geographer and cartographer, born at Frankfort-on-the-Main, Germany. When 18 years old, he became a pupil of Dr. August Petermann (q.v.). Removing to England, Ravenstein was for 20 years (1855–75) in the service of the Topographical Department of the War Office. For long on the councils of the Royal Statistical and Royal Geographical Societies, he was also professor of geography at Bedford College in 1882–83. He was the first to receive the Victoria gold medal of the Royal Geographical Society (1902). His *Systematic Atlas* (1884) puts in practice many of the author's helpful ideas as to methods of teaching cartography. His *Map of Equatorial Africa* (1884) was the most notable map of a large part of the continent on a large scale that had been made up to that time. Ravenstein published also: *Handy Volume Atlas* (1895; 7th ed., 1907); *A Life's Work* (1908); *The New Census Physical, Pictorial, and Descriptive Atlas of the World* (1911).

RAVESTEYN, rä′ve-stīn, Jan Anthonisz van (c.1572–1657). A Dutch portrait painter. He was born at The Hague, where he entered the painters' guild in 1598 and was repeatedly its dean. He is thought to have studied under Mierevelt and was the first to give an historical character to those large groups of magistrates and governors or trustees of corporations and the like in which Frans Hals and Rembrandt displayed such mastery. The Municipal Museum at The Hague contains four such pictures: "Civic Guard Issuing from the Doelen" (1616); "Banquet of the Town Council" (1618); "Meeting of the Town Council" (1636), superior to all others in coloring, full of grave harmony; "Six Officers of the White Arquebusiers" (1638). They are natural, full of vitality, and in color anticipate Rembrandt's golden brown. A large number of his portraits are in Amsterdam and in the Royal Gallery at The Hague, including 21 "Officers in the Dutch Service" (dated from 1611 to 1624). Others are in the Louvre (1633, 1634), Dresden, Berlin, and Munich. The portrait of "Lucretia van der Meulen" is in the gallery of the Historical Society, New York, and the portrait of an unknown lady is in the Metropolitan Museum, New York.

RAVIGNAN, rȧ′vē̇′nyäɴ′, Gustave François Xavier De La Croix de (1795–1858). A French pulpit orator. He was born at Bayonne, studied in the Lycée Bonaparte at Paris, and for a time practiced law. Later he prepared himself to enter the Church, in the College of Saint-Sulpice at Montrouge (as a Jesuit novice), at Dôle, and at Saint-Acheul, where in 1828 he became a professor. On the expulsion of the Jesuits from France (1830) Ravignan withdrew to Switzerland, where he taught and then preached. In 1835 he preached in the cathedral of Amiens and in 1837 was selected to succeed Lacordaire (q.v.) at Notre Dame, Paris, in conducting special conferences for men. For 10 years he occupied this pulpit with notable success. He published an apology of his order in 1844 (Eng. trans., *On the Jesuits, their Institute, Doctrines, etc.,* London, 1844) and in 1854 *Clément XIII et Clément XIV,* intended as a reply to the *Life of Clement XIV* by the Oratorian Father Theiner. His *Conferences on the Spiritual Life* were translated into English (London, 1873; 5th ed., New York, 1895). Consult: Armand de Ponlevoy, *Vie du père Xavier de Ravignan* (2 vols., Paris, 1860; 16th ed., ib., 1907; Eng. trans. of 1st ed., New York, 1869); J. Poujoulat, *Le père Ravignan* (Paris, 1862); E. G. Ledos, *Le père de Ravignan* (ib., 1908).

RAVINE (rȧ-vēn′) **DEER.** See Chinkara; Gazelle.

RAWALPINDI, rä′wŭl-pĭn′dė̄ *or* ra̤′*a*l-. A municipality and the largest military station in India, the capital of a district of the Punjab, British India, between the Indus and Jhelam, 90 miles southeast of Peshawar (Map: India, B 2). It has a fort used as an arsenal and is encircled by a chain of defensive works. Its importance is purely military, although there are large locomotive works and iron foundries. It occupies part of the site of ancient Gajipur, and interesting archæological relics have been unearthed. In 1849 the Sikhs surrendered here after their defeat by Gough at Gujarat. Pop., 1901, 87,688; 1911, 86,483.

RAW′DON-HAS′TINGS, Francis, first Marquis of Hastings. See Hastings.

RAWITSCH, rä′vĭch. A town in the Province of Posen, Prussia, 64 miles south of Posen (Map: Prussia, G 3). It manufactures snuff, cigars, copper, iron, carpets, furniture, and horsehair goods. Rawitsch was founded in 1632 by Protestant refugees. Pop., 1905, 11,403; 1911, 11,525.

RAWLE, ra̤l, Francis (1846–). An American lawyer, born at Freedom Forge, Pa.

He was educated at Phillips Exeter Academy and at Harvard (A.B., 1869; LL.B., 1871; A.M., 1872), was admitted to the bar in 1871, and practiced at Philadelphia. He became known as a profound student of the law and was the reviser of three editions of Bouvier's *Law Dictionary* (Boston, 1883, 1898, 1913). From its organization, in 1878, until 1902 he was treasurer of the American Bar Association, and in 1902 he was elected its president. In 1887 he was appointed delegate from the United States to the London meeting of the Association for the Reform and Codification of the Law of Nations. From 1890 to 1902 he served as overseer of Harvard University. Rawle contributed numerous articles to legal periodicals.

RAWLE, William (1759–1836). An American lawyer, born in Philadelphia. He studied law in New York and at the Middle Temple, London, was admitted to the Philadelphia bar in 1783, and in 1791 was appointed by President Washington United States district attorney for Pennsylvania. In this capacity he prosecuted the leaders of the Whisky Insurrection. He was counsel for the United States Bank and in 1830 assisted in revising the civil code of Pennsylvania. He took much interest in science, philanthropy, and education, being the first president of the Pennsylvania Historical Society, president of the Abolition Society, and for 40 years a trustee of the University of Pennsylvania. His publications include: *Vindication of Rev. Mr. Heckewelder's "History of the Indian Nations"* (1818); *A View of the Constitution of the United States* (1825; 2d ed., 1829); *Discourse on the Nature and Study of the Law* (1832). Consult T. I. Wharton, "A Memoir of William Rawle, LL.D.," in the *Collections of the Pennsylvania Historical Society*, vol. iv (Philadelphia, 1840).

RAW'LINS. A city and the county seat of Carbon Co., Wyo., 117 miles west by north of Laramie, on the Union Pacific Railroad (Map: Wyoming, D 4). It is the seat of the State Penitentiary. Rawlins has considerable commercial importance as the centre of extensive sheep-raising and gold and copper mining interests. The railroad maintains repair shops here. Pop., 1900, 2317; 1910, 4256.

RAWLINS, John Aaron (1831–69). An American soldier, born at East Galena, Ill. At Galena he studied law in the office of Isaac P. Stevens, with whom in 1854 he entered into partnership. By a powerful war speech, delivered shortly after the fall of Fort Sumter, he influenced Ulysses S. Grant to offer his services to the Federal government. Shortly afterward Rawlins became a major in an Illinois regiment, but at the request of Grant, who was now a brigadier general and who had been favorably impressed by Rawlins, he resigned that post in order to become Grant's assistant adjutant general. From that time until the close of the war he was Grant's close friend and adviser. He became chief of staff in November, 1862, and was honored with numerous promotions, ending with that of brevet major general, March 13, 1865. Although he had had no previous military training, Rawlins showed keen insight into military problems. Appointed Secretary of War in Grant's first cabinet, Rawlins died soon after of tuberculosis, the result of exposure during the war.

RAW'LINSON, George (1812–1902). An English historian and Orientalist, brother of Sir Henry Creswicke Rawlinson. He was born at Chadlington, Oxfordshire, Nov. 23, 1812. He graduated at Trinity College, Oxford, in 1838, taking a first class in classics; was elected a fellow of Exeter College in 1840, tutor in 1841, gained the Denyer Theological prize in 1842 and 1843, and subsequently received various high university appointments, including the Camden professorship of ancient history in 1861. From 1872 he was canon of Canterbury Cathedral and was rector of All Hallows' Church, London, from 1888 until his death, which occurred Oct. 7, 1902. His Bampton lectures in 1859 were published under the title of *Historical Evidences of the Truth of the Scripture Records.* His other works include a translation of *Herodotus* (4 vols., 1858–60) with notes and appendices, in which many of his brother's discoveries are incorporated; *The Five Great Monarchies of the Ancient Eastern World—Chaldæa, Assyria, Babylonia, Media, and Persia* (4 vols., 1862–67); *Manual of Ancient History* (1869); *Historical Illustrations of the Old Testament* (1871); the *Sixth Great Oriental Monarchy—Parthia* (1873); the *Seventh Great Oriental Monarchy—the Sassanian or New Persian Empire* (1876); *The Origin of Nations* (1877); *History of Ancient Egypt* (2 vols., 1881); *History of Phœnicia* (1889); *The Story of Parthia* (1885); *Memoir of Major-General Sir H. C. Rawlinson, Bt.* (1898).

RAWLINSON, Sir Henry Creswicke (1810–95). An English soldier, diplomat, and Assyriologist. He was born at Chadlington, Oxfordshire, April 11, 1810, and after education at Wrington and Ealing entered the military service of the East India Company in 1827. His facility in learning Hindustani and Persian made him interpreter at 18, and a year later he became paymaster of his regiment. In 1833, with other English officers, he was appointed to assist in the reorganization of the Persian army. While stationed at Kermanshah in 1835, he began to study the Old Persian cuneiform inscriptions. The results of his research were submitted to the Royal Asiatic Society of London in 1837; in the same year his account of his travels through Susiana was printed in the *Journal* of the Royal Geographical Society, and the following year an account of a journey through Persian Kurdistan appeared. During the course of the Afghan troubles he left Persia to take up an appointment as political agent at Kandahar in 1840 and served throughout the campaign with distinction. He was appointed political agent of the East India Company in Turkish Arabia in 1843, Consul at Bagdad in 1844, and in 1851 was promoted Consul General. His official positions facilitated his archæological researches, and in 1846 his successful decipherment of the Persian cuneiform inscriptions, especially that of Darius Hystaspis at Behistun, marked an epoch in the knowledge of Persia's history and ancient languages and also prepared the way for the decipherment of the other cuneiform alphabets. Its importance is only paralleled by the decipherment of the Rosetta stone. Later successful work was accomplished in excavations in Babylonia for the trustees of the British Museum. He returned to England in 1849, disposing of his collections of Oriental antiquities to the British Museum. In 1851 he returned to Bagdad, but after a stay of four years he resigned his consulship, returning definitely to England. In 1858 he was elected member of Parliament for Reigate, but the same year resigned on being appointed member of the Council of India. In 1859 he went to Teheran as Minister to the Court of Persia. From 1865 to 1868 he again sat in Parliament as member for Frome. In 1871 he was elected president of the Royal Geographical Society. In 1875 his *England and Russia in the East* created a considerable stir, owing to its revelations of the interior workings of Asiatic politics. Rawlinson received the honor of knighthood in 1891 and was a member of the Council of India from 1868 until his death, March 5, 1895. His *Persian Cuneiform Inscriptions at Behistun* (2 vols., 1846), printed in the *Journal* of the Royal Asiatic Society, contained his remarkable decipherment of the famous inscriptions, and his *Cuneiform Inscriptions of Western Asia*, in collaboration with Pinches and others (6 vols., 1861–91), is almost equally important. He contributed largely to Ferrier's *Caravan Journeys* (1856). Many of his discoveries are incorporated in *Herodotus* (1858) by his brother, Canon George Rawlinson (q.v.), who also wrote a *Memoir of Major-General Sir Henry Creswicke Rawlinson, Bt.* (London, 1898).

RAWLINSON, Sir Robert (1810–98). An English civil and sanitary engineer, born at Bristol. He was first employed in work on docks and harbors and then on the London and Birmingham Railway, under Robert Stephenson. After 1840 he worked in Liverpool, where he was assistant surveyor to the corporation and government inspector. In 1855 he was put at the head of the sanitary commission sent by England to the Crimea and did much to lessen the terrible mortality among the soldiers. Rawlinson was knighted in 1883 and in 1894 served as president of the Institution of Civil Engineers. His works include: *Drainage of Towns* (1854); *Lectures on Sanitary Questions* (1876); *Hygiene of Armies in the Field* (1883); *Public Works in Lancashire* (1898).

RAW'MARSH. A town in the West Riding of Yorkshire, England, 2½ miles north of Rotherham, situated on an eminence above the Don. It has collieries, foundries, machine works, and potteries. Pop., 1901, 14,587; 1911, 17,185.

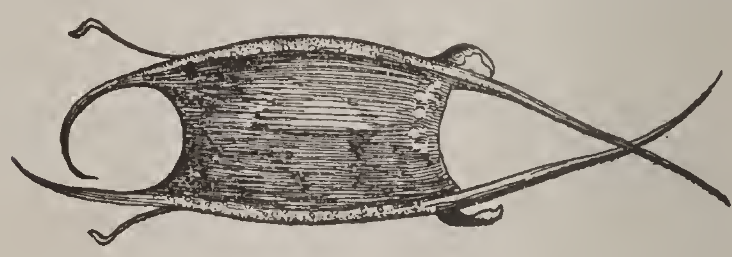
RAWNS'LEY, Hardwick Drummond (1850–). An English clergyman and author, born at Shiplake Vicarage, Henley-on-Thames. After graduating from Balliol College, Oxford, he became curate at the mission of Clifton College, Bristol; vicar of Wray, Windermere (1878–83); then vicar of Crosthwaite, Keswick, rural dean, and canon of Carlisle. In 1912 he was appointed honorary chaplain to the King. He wrote: *Life and Nature at the English Lakes* (1899); *Memories of the Tennysons* (1900); *Literary Associations of the English Lakes* (1902; new ed., 1906); *Months at the Lakes* (1906); *Chapters at the English Lakes* (1913). Several volumes of verse, among them *The Sonnet Chronicle* (1906), came from his pen.

RAW'SON, Albert Leighton (1828–1902). An American Orientalist, mystic, and artist, born at Chester, Vt. Becoming much interested in esoteric orders, he was adopted as brother by the Adwan Bedouins of Moab, was initiated by the Druses on Mount Lebanon, and in America became one of the founders of the Order of Nobles of the Mystic Shrine, also a member of the Theosophical Society and the Society of the Rosy Cross. He illustrated several books dealing with the East, among them lives of Christ by Beecher, Deems, and Crosby, and he painted the portraits of Queen Victoria and other notables. He published various translations from Oriental languages; *Vocabulary of the Bedouin Language of Syria and Egypt* (1874); *Dictionary of Arabic, German, and English* (1876); *Vocabulary of Persian and Turkish Languages* (1877); *Historical and Archeological Introduction to the Holy Bible* (1879–82); *etc.*

RAWTENSTALL, ra̤'ten-sta̤l. A municipal borough in Lancashire, England, on the Irwell, 18 miles north of Manchester (Map: England, D 3). It is a busy manufacturing centre, with woolen, cotton, and carpet manufactures, collieries, and stone quarries. Pop., 1901, 31,000; 1911, 30,516.

RAXIS DE FLASSAN, Jean-Baptiste Gaëtan. See Flassan, J.-B. G. Raxis de.

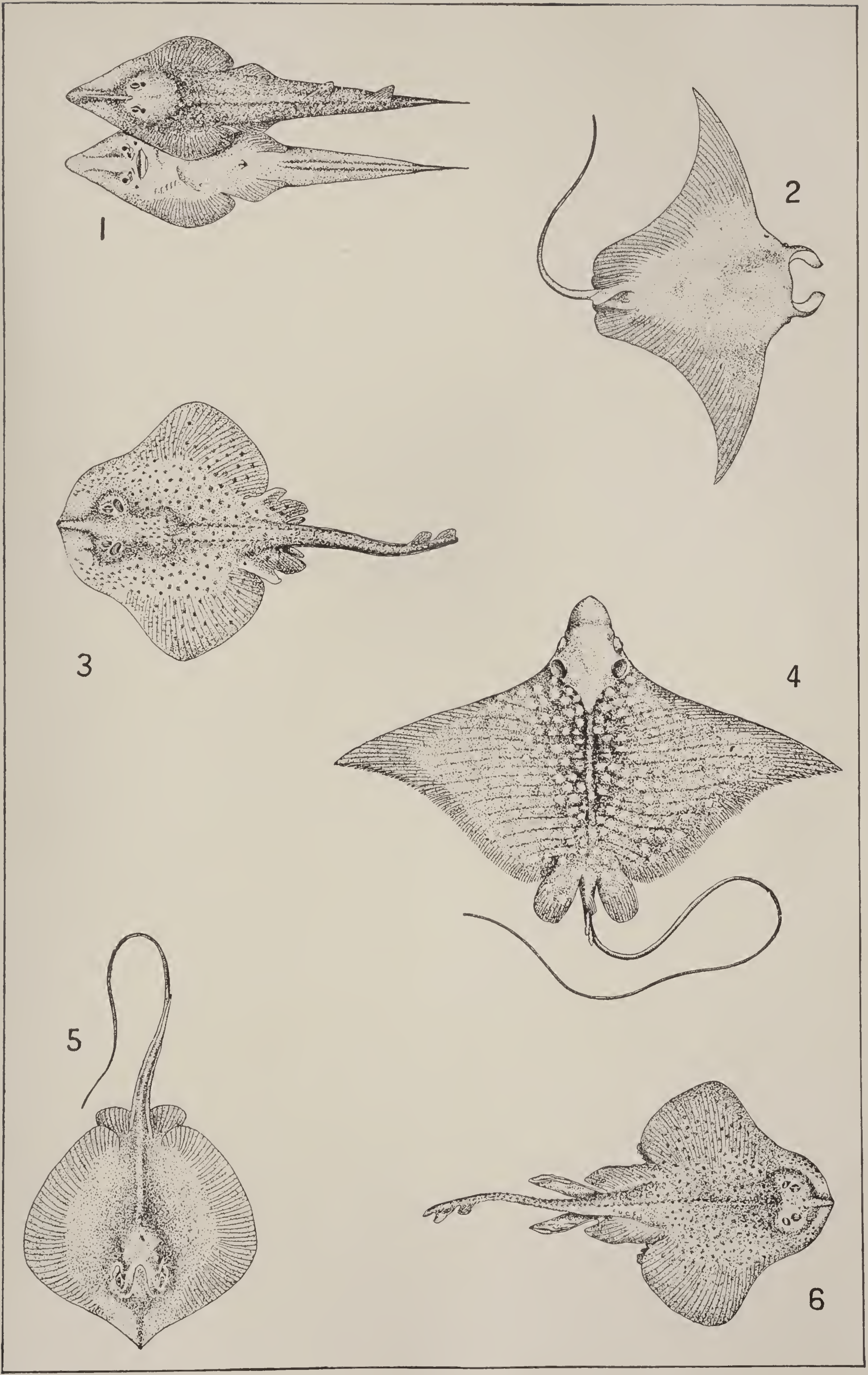
RAY (OF. *raie, raye,* Fr. *raie,* from Lat. *raja,* ray, roach; connected with AS. *reohhe,* LG. *ruche,* Ger. *Roche,* MDutch *roch,* OF. *roche, rosse,* Fr. *roche,* Eng. *roach*). A general name for the elasmobranch fishes of the order Selachii, characterized by the dorsoventrally flattened body. This order includes the sawfishes, sea devils, sting rays, skates, guitar fishes, and torpedoes (qq.v.). The true rays have a flat body; the pectoral fins are large and fleshy, appearing as lateral expansions of the body and along with it forming a circular disk or a rhomboid to which is attached a rather long and slender tail. The pectoral fins are prolonged till they meet in front of the snout and backward till they join the ventral fins. The eyes and spiracles look upward. The gill openings (five) are on the underside of the body, close behind the mouth; and towards the tail are the stomach, intestines, and other viscera. The males are furnished with claspers. Most of the species are egg-laying, but the guitar fishes (*Rhinobatidæ*) are peculiar in that their eggs are retained until they hatch within the body. The eggs are large and are inclosed in thin horny cases resembling those of sharks, but more rectangular in form, with projections at each of the four corners by which they catch upon and are held to eelgrass or other supports until they hatch. These eggs are familiarly known in England as skate barrows and in America as mermaids' purses. Rays are found in all seas, especially in the warmer ones, and commonly inhabit sandy or muddy shores, lying on the bottom, where they feed on mollusks and are often cast up on the beach.



TYPE OF RAY'S EGG.

The most common rays in the United States are those of the typical family Rajidæ, usually called skates. Those of the family Myliobatidæ are called eagle rays (q.v.). A large section of the order is known as the suborder Masticura, or whip-tailed rays, in allusion to the very long slender tail, which in most species, especially of the family Dasyatidæ, is armed near its base by one or more large, jagged, erectile spines, capable of inflicting a severe and even dangerous wound. This has given to those fishes the name of sting ray. The common sting ray of the Atlantic shore is the clamcracker (*Dasyatis centrura*), which abounds from Maine to Cape Hatteras and sometimes reaches a length of 10 to 12 feet. The color is olive brown above and nearly

RAYS AND SKATES



1. GUITAR-FISH (Rhinobatus lentiginosus); upper and lower surfaces.
2. DEVIL-FISH (Manta birostris).
3. BIG SPOTTED SKATE (Raja ocellata).
4. SPOTTED STING-RAY (Aetobatus narinari).
5. FLORIDA STING-RAY (Dasybatis sabina).
6. COMMON SKATE (Raja erinacea).

white below. Until half grown the young are smooth, but as they approach maturity broad conical bucklers appear on the back and tail and many flattened tubercles. This tendency to grow rough with age characterizes most of these fishes, but is sometimes checked, as in the case of the smooth sting ray or batfish (*Myliobatis californicus*) of the Pacific coast. Sting rays gather upon beds of cultivated oysters or in places where clams abound and destroy great numbers of these valuable mollusks. No trace of any poison glands has been found, but Kingsley says that the mucus of the fish probably possesses poisonous qualities.

Fossil selachians allied to the rays are represented by fragmentary remains from Devonian and Carboniferous rocks and by more perfect and abundant material in the Mesozoic and Tertiary deposits. Exquisitely preserved skeletons of *Rhinobatis* from the Jurassic lithographic stone of Bavaria present few differences from modern species of the same genus. Consult: G. B. Goode, *Fishery Industries*, sec. i (Washington, 1884); J. S. Kingsley, *Standard Natural History* (Boston, 1885); Jordan and Evermann, *American Food and Game Fishes* (New York, 1902). See Plate of Rays and Skates.

RAY, Edward (1879–). A British golf champion, born in Jersey. He won the open championship in 1912 at Muirfield and in the following year played in the United States in company with Harry Vardon (q.v.). Both were defeated in the national open championship tournament at Brookline, Mass., by Francis Ouimet, the youthful American amateur champion. Subsequently they played matches in Canada before their return to England. Ray is author of *Inland Golf* (1913).

RAY, Isaac (1807–81). An American physician, born at Beverly, Mass. He graduated in medicine at Bowdoin College in 1827 and in 1841 was appointed superintendent of the Augusta (Me.) State Insane Asylum. He was superintendent of the Butler Hospital for the Insane at Providence, R. I., from 1845 to 1866, when he removed to Philadelphia. He was the author of *Conversations on the Animal Economy* (1829); *Medical Jurisprudence of Insanity* (1838); *A Treatise on Medical Jurisprudence and Insanity* (1839; 5th ed., 1871); *Education in Relation to the Physical Health of the Brain* (1851); *Insanity of King George III* (1855); *Mental Hygiene* (1863); *Contributions to Mental Pathology* (1873).

RAY, John (1628–1705). An English naturalist. He was educated at Cambridge, where he became a fellow and took orders in the Church of England. He resigned his fellowship in 1662 and for a time lived with his friend Francis Willughby, with whom he afterward traveled extensively in England and on the Continent, studying botany and zoölogy. Ray published the following important works on the classification of plants and animals: *Catalogus Plantarum Angliæ* (1670); *Ornithologia* (1676), with Willughby; *Methodus Plantarum Nova* (1682); *Historia Piscium* (1686), with Willughby; *Historia Plantarum* (1686–1704); *Synopsis Methodica Animalium Quadrupedum, et Serpentini Generis Vulgarium* (1693); *Historia Insectorum* (posthumous, 1710). Ray's position in science is an important one in that he was the first to attempt a classification of animals and plants which should express their natural relationships, and he first introduced a workable definition of the term "species." His work furnished the basis upon which Linnæus and Cuvier constructed the modern systems of classification. The Ray Society of London perpetuates his worthy fame. Consult Edwin Lankester (comp.), *Memorials of Ray* (London, 1846).

RAYET, rȧ′yȧ′, Oliver (1847–87). A French classical archæologist, born in Cairou (Lot) and educated at the Normal College and in the French School at Athens (1869), whither he returned after the Franco-Prussian War. Soon afterward (1872–73) the Rothschilds sent him with Albert Thomas to carry on excavations in Miletus (q.v.). In 1884 he became professor of archæology at the Bibliothèque Nationale. The *Monuments de l'art antique* (1884 et seq.) was begun under his editorial charge. His other works appeared mostly in periodicals, but in 1888 were published a *Histoire de la céramique grecque*, edited by Max Collignon, and a series of essays, *Etudes d'archéologie et d'art*. Consult J. E. Sandys, *A History of Classical Scholarship*, vol. iii (Cambridge, 1908).

RAYLEIGH, rā′lĭ, John William Strutt, third Baron (1842–). A British physicist. He was born Nov. 12, 1842, and was educated at Trinity College, Cambridge, graduating in 1865 as senior wrangler in the mathematical tripos and being elected a fellow of his college the next year. He succeeded to the family title in 1873. Lord Rayleigh served as professor of experimental physics in the University of Cambridge during 1879–84 and as professor of natural philosophy in the Royal Institution, London, from 1887 to 1905. He became a fellow of the Royal Society in 1873, vice president of the British Association (section A) in 1882, foreign associate of the National Academy of Sciences (United States), correspondent of the Institute of France, and Officer of the Legion of Honor. In 1896 he was appointed scientific adviser to Trinity House, the British Lighthouse Board. In 1894 he discovered, in conjunction with Sir William Ramsay (q.v.), a new element present in the atmosphere, which he afterward prepared in quantity and named argon. (See Argon and consult the treatise by Rayleigh and Ramsay, Washington, 1896.) For this discovery he received the Barnard medal from Columbia University. His experimental work was in the field of electrical standards and in physical optics, but he carried on important researches in nearly every branch of physics and especially in acoustics. His work was characterized by extreme care and accuracy and the use of the most simple apparatus, often home-made. In 1904 he was awarded the Nobel prize for physics, from 1905 to 1908 he held the presidency of the Royal Society, in 1905 he became a member of the Privy Council, and in 1908 was chosen chancellor of Cambridge University. When the Order of Merit was instituted in 1902, he was admitted as one of the original civil members. He wrote, besides many valuable papers for the *Philosophical Magazine* and the *Philosophical Transactions*, *The Theory of Sound* (2 vols., 1877–78 and 1894–96), and edited J. Clerk-Maxwell's *Heat*. His collected papers were published in five volumes (London, 1899–1912).

RAYMOND VI. Count of Toulouse. See Toulouse, County of.

RAY′MOND, Andrew van Vranken (1854–). An American Presbyterian clergyman and educator, born at Vischer Ferry, N. Y. He graduated at Union College in 1875 and at the New Brunswick Theological Seminary in 1878. He served as pastor of Reformed churches at Paterson in 1878–81 and at Plainfield in 1881–87, and of the Fourth Presbyterian Church at Albany in 1887–94. He was president of Union College from 1894 to 1907 and then returned to the ministry, when called to the First Presbyterian Church of Buffalo. He published a history of *Union University* (3 vols., 1907).

RAYMOND, Bradford Paul (1846–1916). An American educator, born near Stamford, Conn. He served through the last year of the Civil War and in 1866 entered Hamline University, Red Wing, Minn. On its suspension in 1869, for lack of funds, Raymond hired the college buildings and conducted the institution to the close of the year. Graduating in 1870 from Lawrence University (Appleton, Wis.), he afterward studied theology at Boston University and philosophy at Leipzig and at Göttingen. Between 1874 and 1883 he was pastor of Methodist churches at New Bedford, Mass., Providence, R. I., and Nashua, N. H., and afterward was president of Lawrence University (1883–89), president of Wesleyan University (1889–1908), and, at the latter institution, professor of ethics and biblical literature (after 1909).

RAYMOND, rå'môɴ', Fulgence (1844–1910). A French neurologist, born at Saint-Christophe (Indre-et-Loire). He studied at the Ecole Vétérinaire at Alfort, where he became instructor of anatomy and physiology in 1866. Subsequently, after graduating in medicine at Paris in 1875, he settled in the French capital and became hospital physician (1878), agrégé (1880), and professor of neurology at the Saltpêtrière (1894), succeeding Charcot. In 1899 he was elected a member of the Academy of Medicine. Raymond, the leading French neurologist of his time, made valuable contributions in his special field. His writings deal mostly with nervous and mental pathology, tabes dorsalis, poliomyelitis, and progressive muscular atrophy in syphilis. Among his works are: *Etude anatomique, physiologique, et clinique sur l'hémianasthésie* (1876); *Maladies du système nerveux* (1888–94); *Leçons sur les maladies du système nerveux* (1896 et seq.), published yearly and giving a splendid review of the progress of neurology, especially of the author's own school; *La psychasthénie* (1907); *Neurasthénie* (1907).

RAY'MOND, Henry Jarvis (1820–69). An American journalist and politician, born at Lima, Livingston Co., N. Y. He graduated at the University of Vermont in 1840 and removed to New York City, where he studied law and contributed to the *New Yorker*, edited by Horace Greeley. When in 1841 Greeley founded the *Tribune*, Raymond became associated with him as assistant editor. In 1848 he left the *Tribune* and took an editorial position on the *Courier and Enquirer*, becoming at the same time associated with the publishing house of Harpers as a literary adviser. In 1851 he founded the New York *Times*, the first number of which appeared on September 18 of that year. He was a strong antislavery Whig, and, after serving in the State Assembly, in 1854 he was elected Lieutenant Governor of the State. In 1856 he became one of the most active and influential leaders of the new Republican party in New York, was a member of its first national convention, and drafted the famous *Address to the People*. In 1861 he was again elected to the State Assembly and chosen Speaker. In 1864 he was elected to Congress. After Lincoln's death he took the position that the Southern States had never actually been out of the Union and gave his partial support to Johnson's plan of reconstruction. In 1866 he left the Republican party, was one of the promoters of the National Union Convention at Philadelphia, and wrote the *Address and Declaration of Principles* adopted by it. As a newspaper editor he ranks as one of the great figures of American journalism. Raymond was the author of *A Life of Daniel Webster* (1853); *Political Lessons of the Revolution* (1854); *Letters to Mr. Yancey* (1860); *A History of the Administration of President Lincoln* (1864), enlarged and republished in 1865 as *The Life and Public Services of Abraham Lincoln.* Consult Augustus Maverick, *Henry J. Raymond and the New York Press for Thirty Years* (Hartford, 1870).

RAYMOND, John Howard (1814–78). An American educator, born in New York City. He studied at Columbia College, but graduated at Union College in 1832, studied law at New Haven, and in 1834 entered the theological seminary at Hamilton, N. Y. In 1839 he became professor of rhetoric and belles-lettres at Madison (succeeded by Colgate) University, and in 1850 professor of belles-lettres at the University of Rochester. He organized the Brooklyn Collegiate and Polytechnic Institute in 1856 and from 1865 until his death was president of Vassar College and professor of mental and moral philosophy there. Consult H. R. Lloyd, *The Life and Letters of John H. Raymond* (New York, 1880).

RAYMOND, John T. (1836–87). An American comedian, whose real name was O'Brien. He was born in Buffalo, N. Y. In 1858 he made his early success with Sothern in *Our American Cousin,* in which he afterward appeared in London and in Paris. His greatest popular hit, however, was as Col. Mulberry Sellers in a dramatization of Mark Twain's *Gilded Age* (1873), a character that became completely identified with his own breezy optimism. Consult Matthews and Hutton, *Actors and Actresses of Great Britain and the United States* (New York, 1886), and McKay and Wingate, *Famous American Actors of To-Day* (ib., 1896).

RAYMOND, Miner (1811–97). An American Methodist Episcopal clergyman, educator, and theologian, born in Rensselaerville, N. Y. He was educated at the Wesleyan Academy (Wilbraham, Mass.), where he was in charge of the English department (1834–38) and president (1847–64). In 1838 he entered the ministry, joining the New England conference of his denomination, and later the Rock River conference. For many years after 1864 he served as professor of systematic theology in Garrett Biblical Institute. Dr. Raymond was a member of several General Conferences. He was the author of *Systematic Theology* (3 vols., 1877), which was translated into Japanese.

RAYMOND, Rossiter Worthington (1840–). An American mining engineer and metallurgist, born in Cincinnati, Ohio. He graduated at the Brooklyn Polytechnic Institute in 1858. After three years at Heidelberg, Munich, and Freiberg he entered the Federal army as additional aid-de-camp with the rank of captain. In 1864 he began practice in New York as a consulting engineer and in 1868–76 was United States Commissioner of Mining Statistics. After 1867 he was connected with leading American mining journals. From 1870 until 1882 he was also lecturer in Lafayette College on economic geology. An original member of the American Institute of Mining Engineers Raymond was president of the Institute (1872–74), secretary (1884–1911), and thereafter secretary emeritus. He also became a member of many foreign engineering societies and in 1911 was awarded the Japanese Imperial Order of the Rising Sun (fourth class). Throughout his active life he was identified closely with all that pertained to his profession. He published annual reports of mining statistics (1868–75), *Peter Cooper* (1901), and a number of stories.

RAYMOND OF PEÑAFORTE, pā′nyȧ-fôr′tȧ (San Raimundo de Peñafort) (c.1175–1275). A Spanish theologian, born at the castle of Peñafort in Catalonia and educated at Barcelona and Bologna, where he obtained the degree of J.U.D. On his return to Spain he became canon of Barcelona (1219), then archdeacon, and in 1222 a member of the Dominican Order, of which he was made general in 1238. In 1230 he was appointed by Gregory IX to codify the canon law. His *Decretalia* form the fifth volume of the present canon law, and his *Summa de Pœnitentia* (printed in 1603) make a compendium of ecclesiastical jurisprudence. Raymond became Archbishop of Tarragona in 1235 and was prominent in the work of the Inquisition in France and Aragon, and in preaching crusades against the Moors. He was canonized in 1601, and January 23 was made his day. Consult Danzas, *Raymond de Pennafort* (Poitiers, 1885).

RAYMOND OF SABUNDE, sȧ-bōōn′dȧ (?–1437). A Spanish theologian. He was born in Barcelona, taught theology, philosophy, and medicine at Toulouse (1430–32), and died as rector of the university there. His fame rests upon his natural theology, which he wrote in Spanish, but which appeared in a Latin translation after his death and has been widely circulated (latest ed., Sulzbach, 1852). Montaigne translated it into French (Paris, 1569; latest ed., 1605). This famous book employs the expression now so familiar, that there are two books by which the truth can be known, the book of Nature and the book of Revelation. The difference is that in the latter truth is given dogmatically in the shape of precept, whereas in the former truth is arrived at by means of investigation and ratiocination. He was a mystic of the school of Raymond Lully (q.v.). Consult: Matzke, *Die natürliche Theologie des Raymundus von Sabunde* (Breslau, 1846); Huttler, *Die Religionsphilosophie des Raymundus von Sabunde* (Augsburg, 1851); Kleiber, *De Raymondi Vita et Scriptis* (Berlin, 1856); D. Beulet, *Un inconnu célèbre: recherches historiques et critiques sur Raymond de Sabunde* (Paris, 1875).

RAYNAL, rȧ′nȧl′, Guillaume Thomas François (1713–96). A French author. He was born at Saint-Geniez and was educated for the priesthood with the Jesuits of Pézénas. In 1747 he went to Paris and was attached to the church of Saint-Sulpice. His peculiarities soon led him out of the Church, and he became one of the editors of the *Mercure de France*, where his philosophic mind found associates and scope and his taste for history made him an historian. His works, though not now of high value, were conspicuous in their time, when philosophy and literary independence were novelties. Among them was *Histoire philosophique et politique des établissements et du commerce des Européens dans les deux Indes* (1770), which contained writings of Diderot as well as Raynal and fell under the condemnation of the Parliament in 1781. His *Révolution d'Amérique* appeared in an English translation in London (1781), and was severely criticized by Thomas Paine. Consult his *Life* by B. Luneb (Rodez, 1856).

RAY′NER, Isidor (1850–1912). An American lawyer and statesman, of Jewish extraction. He was born in Baltimore and was educated at the universities of Maryland and Virginia. He was admitted to the bar in 1871 and began to practice in Baltimore. A Democrat, he served in the Maryland House of Representatives in 1878–80 and in the Senate in 1886–87. While a member of Congress (1887–89, 1891–95) he became known for his eloquent advocacy of the repeal of the silver-purchase clause of the Sherman Act. From 1899 to 1903 he was Attorney-General of Maryland. As counsel for Admiral Schley before the naval board of inquiry, he astonished the country by his eloquence and knowledge of admiralty law and naval technology. Rayner served as United States Senator from 1904 till his death. In the Senate he early became a Democratic leader and one of the severest critics of President Roosevelt. As a student of constitutional law he opposed what he considered the presidential usurpation of power and upheld the traditional division of control among the three departments of government. He was also one of the foremost critics of the Railroad Rate Bill. In 1912 he made a notable reply to Roosevelt's "Charter of Democracy" speech.

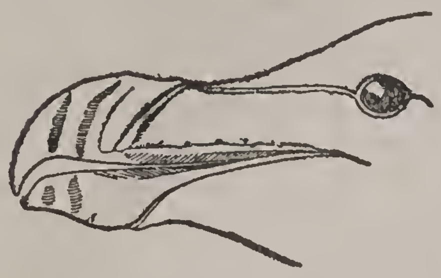
RAYNEVAL, Joseph Mathias Gérard de. See Gérard de Rayneval, J. M.

RAYNOUARD, rȧ′nōō′är′, François Juste Marie (1761–1836). A French philologist and poet, born at Brignoles. He studied at Aix, became advocate, entered politics as a Girondin deputy (1791), was imprisoned during the Terror, and, achieving reputation as a dramatist and poet, was elected to the Academy (1807), of which he became perpetual secretary in 1817. After the fall of the Empire he distinguished himself by linguistic researches, especially in Provençal. His theories, though often false, stimulated the progress of Romance philology. (See Romance Languages.) Noteworthy are his poem *Socrate dans le temple d'Aglaure* (1803), the tragedy *Les templiers* (1805), his anthology of troubadour poetry (1816–21), and a troubadour lexicon *Lexique roman* (1838–44). His linguistic theories are embodied in the *Recherches sur l'ancienneté de la langue romane* (1816) and the *Grammaire comparée* (1821).

RAZIN, rä′zĕn, Stenka (?–1671). A Russian Don Cossack, instigator of several rebellions in the seventeenth century. First mentioned in 1665, he was elected leader of the rebellious Cossacks in 1667. After plundering the caravans and fisheries along the Volga and meeting defeat in Persia (1668), he attacked Russia. Pardoned once by Alexis, he rebelled again. Joined by dissatisfied elements, Razin was at first successful, captured many cities, and ruled along the Volga as far as Nizhni Novgorod. Then he was several times defeated, and in 1671 was executed at Moscow. He was a hero of the popular *byliny*, and Kostomarov made him the subject of a special historical monograph (St. Petersburg, 1859).

RA′ZORBACK′. A whale, the finback (q.v.). Also a name in the United States for a semiwild hog, common in the Southern States.

RA′ZORBILL′, or Razor-Billed Auk. An auk (*Alca torda*), very common on the coasts of the North Atlantic, frequenting lofty precipices, from which its eggs are taken, with those of guillemots, by persons who are let down by ropes. The eggs are esteemed a delicacy and the flesh of the bird itself is much used for food. The razorbill is about 17 inches long and takes its name from its sharp-edged, puffin-like beak. The anterior parts, back, wings, and tail, are black, the breast and belly white. It is a very fierce bird, and, if seized, will lay hold of the hand in return. The egg is about 3 inches long, bluish white or buffy, heavily spotted with brown. Great numbers of razorbills are annually killed for the sake of their feathers, particularly on the coast of Labrador, where they are extremely abundant. See Auk.


BILL OF RAZORBILL.

RAZOR CLAM. An edible bivalved mollusk of the family Solenidæ, whose elongated shell, gaping at each end, suggests the handle of a razor. (See Colored Plate of Clams.) The species are numerous and inhabit the sands of all shores except in the coldest parts of the world. The common species of the eastern coast of the United States is *Ensatella americana*, which is an inhabitant of sand flats and bars where the water is pure. They live in holes which run down vertically 2 or 3 feet and into which they retreat when alarmed. It is useless to attempt to dig them out, as they burrow so rapidly that they are soon beyond the reach of the spade. This species is 5 or 6 inches long, about 1 inch broad, and handsomely colored.

RAZORS. See Cutlery.

RÊ, rā (less correctly Ra). The name by which the sun god was most generally known in ancient Egypt. According to the Egyptian myths Rê appeared upon the surface of the primeval ocean and, overcoming the powers of darkness, brought order out of chaos and assumed the government of the world. He reigned for a long period, but finally grew old, the gods became unruly, and the great goddess Isis, who was profoundly versed in magical lore, took advantage of his failing strength to wrest from him by a stratagem his secret name, the source of his power. Even men rebelled against him, and in his anger he sent down the goddess Hathor to destroy them, but he relented at the sight of the terrible slaughter and turned the goddess from her purpose. Wearied at length with the struggle, Rê gave up the government of the world and retired to rest in heaven upon the back of the celestial cow. With the spread of the solar religion throughout Egypt, Rê was identified with a number of local deities who were regarded as special manifestations or phases of the same god. Horus of Edfu, e.g., was the morning sun rising upon the horizon or the sun of spring coming forth in renewed activity after the gloom of winter. Tum or Atum of Heliopolis, the great centre of solar worship, was the sun setting in the west, and Osiris represented the same phase. The identification was gradually extended to divinities like Ammon of Thebes and Min of Koptos, who originally possessed no solar character whatever, and in course of time nearly every divinity in the Egyptian pantheon came to be identified with Rê. Amenophis IV, of the eighteenth dynasty, carrying this theological tendency to its logical conclusion, endeavored to establish a species of monotheism based upon the worship of Rê, under the new name of Aten or the solar disk, as the universal source of life, but the reformed religion died with its founder. Rê is usually represented as a hawk-headed man holding in one hand the symbol of life and in the other the royal sceptre. Upon his head is the solar disk in the coil of the uræus serpent. In the Book of the Dead (q.v.) the god is conceived as sailing through the heavens during the day in his bark, giving light to the world, and as continuing his voyage at night through the lower world, to rise again the following day. As he advances his brilliant rays overwhelm the fiends who would impede his progress. The Egyptian Pharaohs were believed to be direct descendants of the god, and from the time of the fifth dynasty the title Son of Rê formed an essential part of the royal titulary. Consult E. A. T. Wallis Budge, *The Gods of the Egyptians* (London, 1904), and Adolf Erman, *Die ägyptische Religion* (Berlin, 1905). See also Egypt, *Ancient Egypt*, Ancient Religion.

RÉ, rå, Ile de. A small island on the coast of the Department of Charente-Inférieure, France, opposite the city of La Rochelle, from which it is separated by the Pertuis Breton (Map: France, N., D 6). It is about 16 miles long and 3 miles broad and consists mainly of sand dunes, with cliffs on the southeast coast, where there are several forts. Saint-Martin (pop., 1911, 2265), the capital of Ré, is a well-fortified little town, with a good harbor and trade. The chief occupations of the inhabitants are fishery, oyster farming, viticulture, and the manufacture of salt. In 1627, while the Huguenot stronghold of La Rochelle was besieged by the forces of Louis XIII, the English, under the Duke of Buckingham, made a powerful but unsuccessful expedition against the island.

REA, rā, Samuel (1855–). An American engineering expert and railroad president, born at Hollidaysburg, Pa. At 15 he entered the engineering department of the Pennsylvania Railroad. Later he also managed the construction of the Baltimore and Ohio Railroad tunnels under the city of Baltimore. After being connected with several roads he returned to the Pennsylvania, from 1892 to 1897 serving as special assistant to the president and then till 1899 as his first assistant. Between 1899 and 1909 he rose from fourth to first vice president, and in 1913 he was made president of the entire system and affiliated lines. Rea had general charge of the construction of the Pennsylvania station and approaches in New York, including tunnels under the Hudson and East rivers, an engineering accomplishment of very high order. In recognition of the completion of this undertaking the University of Pennsylvania gave Rea the degree of Sc.D. in 1910. In 1914, before the Interstate Commerce Commission, he advocated the increase of freight rates. He published *The Railways Terminating in London* (1888).

REAC′TION. In psychology, a term used to denote response to sensory stimuli. In experimentation this response takes the form of physical action, and as the stimulus applied is also physical, the time between the giving of the stimulus and the response may be readily measured by means of electrical appliances and delicately adjusted clocks. This time is called the reaction time and includes physical and physiological factors in the process measured. The physiological factor is made up of an afferent (sense organ to brain), a central (brain), and an efferent (brain to reacting muscle) process. Reaction time varies both with individuals and with practice and since the physical and the afferent and efferent physiological processes may be assumed or shown to be fairly constant, it affords a fair test of variation in the times of the central factor and its concomitant mental processes.

Simple reaction time may be determined in many ways. Let us suppose that a clock, recording to the thousandth of a second, is connected electrically with a hammer and an electric key. The connections are so arranged that the hands of the clock begin to move when the hammer falls upon its block. The sound thus made serves as stimulus to the reactor, who presses the button of the key as soon as he has heard it; the pressing of the button stops the clock hands, and the time of reaction (the time elapsing between the giving of the simple stimulus and the execution of the simple movement made in response to it) is thus registered in thousandths of a second. Very many observations have been made with auditory, visual, and tactual stimuli, so that the norms of reaction are now well established.

The simple reaction time varies largely with direction of the attention. The reactor may seek to distribute his attention, to attend both to the coming stimulus and to the movement of reaction; or he may attend predominantly (almost exclusively) to the sensory stimulus; or again to the movement. So we have three norms of reaction time—the central or natural time, the sensorial or complete time, and the muscular or abbreviated time. The natural time of an untrained subject will differ, according as he is disposed by mental constitution to attend mainly to his own movement or to the stimulus presented to him; but it will, in every case, lie somewhere between the two extreme times. The norms for these extremes (in thousandths of a second), as determined with practiced subjects, are:

SENSE ORGAN	Sensorial	Muscular
Sight	270	180
Sound	230	120
Touch	210	110

These times differ with differences of sense organ appealed to; and the average difference between the two times for the same sense department is one-tenth second.

The simple reaction experiment under its qualitative aspect presents the exact type of a voluntary action; it is an impulsive action reduced, by laboratory devices, to its lowest terms; it differs from the impulsive actions of real life only by greater simplicity of motive (stimulus) and greater simplicity of responsive movement. We may therefore make it the basis of an introspective examination of action at large; in which case the time values have merely a regulative importance, as an external check or control upon the validity of introspection.

We note that the course of the simple reaction may be qualitatively changed in various ways. The subject may be required to react to stimuli of different quality (e.g., tones, colors); to stimuli of different intensity (e.g., weak and strong pressures); to stimuli of varying intensity or quality (e.g., irregular alternation of loud and weak noises); under distraction; and without preadjustment of attention, i.e., without any signal that the experiment is about to begin. Further, the complex types of action may be studied. (See ACTION.) The subject may react to one of two or more known stimuli; he is told, perhaps, that either black or white will be shown and that he is not to move until he has made sure of the nature of the impression (discriminative reaction). Or he may be left in the dark, save in a general way, as to the nature of the stimulus: he is to react to a visual impression and not to move until he has made sure of it, but the impression may be a black, white, gray, or a color (cognitive reaction). Again, he may be told that either black or white is to be shown and that he is to respond to black by a right-hand and to white by a left-hand movement. Here we have the conflict of impulses characteristic of selective action (choice reaction).

We further note, first, that an association may be interpolated into the course of the reaction. The reactor is shown a color; he is not to move until he has associated some idea to the color. The time of the association reaction minus the time of the simple reaction to the same stimulus gives us a rough measure of the duration of association. It averages three-quarters of a second. Secondly, we find that the cognition of intensities takes a longer time than that of qualities. Thirdly, the reaction time to tonal fusions lasts longer the higher the fusion degree; we cognize a minor third more quickly than we cognize a major third. Finally, the reaction method enables us to trace the course of habituation, fatigue (q.v.), expectation, and practice (q.v.). See PSYCHOLOGICAL APPARATUS.

It has been proposed to use the association reaction, diagnostically, for the detection of repressed ideational complexes, both when the repression is voluntary, as it is in the criminal who attempts to conceal his knowledge of a crime, and when it is involuntary, as it is in the case of an hysterical person. (See HYSTERIA.) Reactions are taken to a list of words, some of which are related to the topic suspected of being repressed or concealed. In a case of concealment one should find either that the character of the replies to the significant words indicates by logical connection the concealed ideas or, if the replies are entirely noncommittal, that the reaction times for the significant words are longer.

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(Göttingen, 1905); W. M. Wundt, *Physiologische Psychologie* (6th ed., Leipzig, 1908–11; Eng. trans. of 5th Ger. ed. by E. B. Titchener, New York, 1905); Oswald, Külpe, *Outlines of Psychology*, English translation by E. B. Titchener (new ed., London, 1909); E. B. Titchener, *Text-Book of Psychology* (New York, 1910); J. V. Breitwieser, *Attention and Movement in Reaction Time* (ib., 1911); J. W. Todd, *Reaction to Multiple Stimuli* (Lancaster, Pa., 1912). On diagnostic association, see C. G. Jung, *Lectures and Addresses at the Twentieth Anniversary of Clark University* (Worcester, 1910).

REACTION, Chemical. A term applied to the transformations of substances into other substances having more or less different properties. (See Chemistry.) It is noteworthy that the mutual transformations of the allotropic modifications of one and the same element must be considered as chemical reactions. Thus, the transformation of yellow phosphorus into red phosphorus is a chemical reaction. In essence the two substances are identical, but they nevertheless differ in their chemical behavior, and under the same physical conditions they possess different physical properties; so they must be considered as two distinct chemical individuals and their transformation into each other must be considered as a chemical reaction.

The general laws according to which chemical reactions take place include the law of the conservation of matter, the law of the conservation of the elements, the law of definite combining masses, the law of combining volumes, the law of mass action, and, of course, the law of the conservation of energy. The conservation of energy plays an important part in thermochemistry and electrochemistry (qq.v.). The other laws, with the exception of that of mass action, have been considered in the general article Chemistry (q.v.). In the present article it remains to discuss briefly the action of masses.

At first consideration the concept of mass action appears to contradict the law of definite proportions. According to the latter, while substances may be mixed in any proportion whatever, chemical combination takes place only between definite relative quantities. Thus, oxygen combines directly with hydrogen only in the proportion of eight parts (by weight) of the former to one of the latter, whether a given mixture in which the reaction is caused to take place contains the two gases in this or in any other proportion. What, then, can the masses of the reacting substances have to do with the course of the reaction? A simple example may serve to illustrate the point in question. Ordinary alcohol and acetic acid combine in the proportion of 46 parts of the former to 60 parts of the latter. If 46 grams of the alcohol should be left in contact with 60 grams of the acid for a sufficiently long time, 30.7 grams of the alcohol would combine with 40 grams of the acid (30.7 : 40 = 46 : 60), yielding 58.7 grams of ethyl acetic ester and 12 grams of water. The rest of the alcohol (15.3 grams) and of the acid (20 grams) would remain uncombined, side by side with the ethyl acetic ester and water, no matter how long the mixture was kept (in one experiment the mixture was actually kept for 17 years). Now, if instead of 46 grams a larger quantity of alcohol were left in contact with 60 grams of acetic acid, more of the latter would ultimately be found to have entered into combination, and consequently less than 20 grams of it would ultimately remain free. But the proportion of alcohol and acid combined would still be 46 parts of the former to 60 parts of the latter. This example illustrates the following principles: (1) whatever the proportion of the reacting substances present, chemical combination takes place between the same relative quantities; (2) whatever the proportion of the reacting substances present, the possible maximum of each may not enter into combination, a fraction of the several substances present refusing to combine at all as long as they remain in contact with the products of the reaction; (3) the amounts of the substances present determine the fraction that will enter into combination and the fraction that will remain free. The first of these principles is nothing else than the law of definite proportions. On the other hand, the doctrine of mass action has reference to the second and third of these principles, dealing, not with the relative combining quantities, but with the extent to which combination takes place.

A fact of the greatest importance for the theory of chemical transformations is that the course of many reactions can be reversed. For instance, we just said that ordinary alcohol and acetic acid partly combine to form ethyl acetic ester and water. But ethyl acetic ester and water, if allowed to remain mixed for a sufficient length of time, will react and produce free acetic acid and alcohol. In this transformation again the ester and water would partly react (in accordance with the law of definite proportions) and partly remain unchanged. Quantitative experiment would reveal the following facts: (1) if we should mix 88 grams of the ester with 18 grams of water (88 and 18 are, respectively, the reacting weights of the two substances), then 29⅓ grams of the former and 6 grams of the latter would react to form 20 grams of free acetic acid and 15⅓ grams of alcohol, while the remaining 58⅔ grams of the ester and 12 grams of water would refuse to enter into reaction; (2) if, after all change has ceased in our mixture, we should add to it a further quantity of either ester or water, then a further (but not complete) decomposition of ester into alcohol and acid would take place; (3) if, on the contrary, after all change has ceased in our mixture, we should add to it, not ester or water, but either free acetic acid or alcohol, a further change would take place, resulting in the formation of more ester and water. It would thus become clear that in a mixture of reacting substances with the products of their reaction, when the mixture is in a state of chemical equilibrium, we may cause a reaction to take place either in one direction or in the opposite direction by changing the relative masses of the ingredients. In other words, the masses of substances may determine the course of a chemical reaction. The importance of this statement in chemical theory will be so much the more obvious if we consider that there is good reason for assuming that all reactions are reversible. Says Nernst: "It has been formerly often maintained that 'reversible reactions' are exceptional, or that two different classes of reactions must be distinguished, reversible and nonreversible. But no such definite line of demarcation exists by any means, and there is no doubt that under appropriate experimental conditions it will be possible to cause any reaction whatever to take place now in one, now in the opposite direction; that is to say, *in principle every reaction is reversible.*"

The old notion of chemical affinity as the sole cause of reactions must be either discarded or essentially modified. The course of reactions and the final equilibrium to which that course leads are certainly influenced by the chemical affinities (whatever may be their ultimate nature); but those affinities are not alone in determining the chemical phenomena which they influence. In studying reversible reactions it is found that the action of masses comes in as a factor in all cases, without an exception. But it is also found that if chemically equivalent masses are started with in all cases, the fractions of those masses actually entering into reaction and the fractions remaining unchanged vary from case to case. In other words, as just stated, the equilibrium finally attained depends both on the nature of the reacting substances and on the masses present to start with.

Still another factor takes part in influencing the course and end of reactions, viz., the temperature. Or, more exactly, the specific affinity factor at work in each case varies with the temperature. But this variation will be considered under THERMOCHEMISTRY, and may be left out of account in the present discussion, in which all reactions are assumed to take place at constant temperature.

We have seen above that the total fraction found transformed when a reaction is over depends, among other things, on the masses present at its beginning. Similarly it may be demonstrated by facts that the fraction transformed in a given interval of time during the reaction depends on the masses present at the beginning of that interval. And since the reaction itself obviously changes the masses present, part of the original substances gradually disappearing as such and masses of the products of the reaction gradually appearing in their stead, it is evident that the magnitude of the fraction transformed in unit of time varies from instant to instant. Were this not so, the velocity of a chemical reaction might be defined in terms of the amounts found transformed in any finite interval of time. But since, as just explained, the velocity is variable, it can be defined only in terms of the infinitely small amounts transformed in infinitely short intervals of time. (If this does not seem clear, see the article CALCULUS.) It may, however, be asked: But why consider at all the velocity of reactions? The answer is, Because it is the velocity that is immediately determined by affinity and mass action; and so, conversely, it is by measuring the velocity that affinity and mass action can be studied quantitatively. In the case of a reversible reaction the direction of the change is the direction in which the velocity of reaction is the greater; the amount actually found transformed in any time depends on the difference between the velocities with which the two opposite reactions take place; and when the two velocities are equal there is equilibrium. Thus the velocities of a reaction described its course completely.

An even more important reason for studying the velocities of chemical reactions is as follows. Every ordinary chemical equation indicates that a certain number of molecules of a first substance react with a certain other number of molecules of a second substance to produce so many molecules of the reaction products. But the numbers thus involved are merely the smallest integral numbers that can be taken; the equation expresses the working, in the given case, of the law of conservation of mass (see CHEMISTRY), but it tells us nothing as to the actual mechanism of the reaction, nothing as to the numbers of molecules actually taking part in the reaction. Such information, as Van't Hoff has shown, can be obtained only by a study of the velocity of the reaction. In other words, a chemical reaction is only very superficially understood until the velocities involved become known.

The velocities of all reactions increase rapidly with rising temperature. They are also affected by the presence of certain substances that do not figure in the chemical equation at all. See CATALYSIS.

The development of the principles discussed in the preceding paragraphs forms the object of chemical kinetics and statics, the two subdivisions of the modern science of chemical dynamics. Chemical kinetics deals with chemical change; chemical statics with chemical equilibrium. At the basis of both is the law of mass action in its precise mathematical form, which may now be considered as established beyond the slightest possibility of doubt. For it has been demonstrated in three different ways: (1) by mathematical deduction from the kinetic theory of gases; (2) in its static form, by mathematical deduction from the laws of thermodynamics; and (3) by extensive experimental observation.

Correctly, but vaguely, the action of masses was first understood by the Frenchman Berthollet in the beginning of the nineteenth century. In 1867 Guldberg and Waage, two Norwegian investigators, published a work (*Etudes sur les affinités chimiques*) in which the principles of chemical statics and kinetics were first stated and demonstrated in their rigidly mathematical form. Van't Hoff discovered the law of mass action independently in 1877; and from this date may be said to commence a new epoch in theoretical chemistry. The principal names connected with the demonstration and the mathematical and experimental development of the law are, besides those of Guldberg and Waage, the names of Van't Hoff, Horstmann, Willard, Gibbs, Arrhenius, and Ostwald.

For further information, consult the works on theoretical and physical chemistry recommended in the article CHEMISTRY. See also ACIDS; CATALYSIS; DECOMPOSITION; DISSOCIATION; ELECTROCHEMISTRY; ESTERS; SOLUTION; THERMOCHEMISTRY.

REACTION TIME. See IRRITABILITY; PSYCHOLOGICAL APPARATUS; REACTION.

READ, CHARLES (1819–98). A French scholar, born in Paris, where he studied law. He was a magistrate and then an official in the department of religious education (1852–58) and in that of historical documents (1865–70). In 1852 he founded the French Protestant Historical Society. His own labors preliminary to a history of the Reformation in France, which he did not complete, were mostly editorial, and include editions of Chamier's journal (1859), of Agrippa d'Aubigné's *Tragiques*

(1872) and his *Enfer* (1873) and *Printemps* (1874), and of Hotman's *Tigre* (1875).

READ, George (1733–98). An American patriot, one of the signers of the Declaration of Independence. He was born in Cecil Co., Md., received an academic education at Chester, Pa., studied law, and in 1752 was admitted to the bar in Philadelphia. Two years later he established himself in practice in Newcastle, Del. From 1763 to 1774 he was Attorney-General for the crown for the counties of Kent, Delaware, and Sussex. In 1774 he was elected to the first Continental Congress. He was conservative and at first stoutly opposed the idea of independence, but finally became convinced that independence was the only course and affixed his signature both to the petition to King George and to the Declaration. Thenceforward he was enthusiastic in his support of the Colonial cause, and as chairman of the first Naval Committee (1775–77) was largely instrumental in the establishment of the first American navy. In 1776 he framed the new constitution of Delaware, presided over the convention which adopted it, and became Vice President and acting President (Governor) of the new State. He codified the Delaware laws, and in 1782 became a judge of the United States Court of Appeals for Admiralty Cases. He was a delegate to the Annapolis Convention of 1786, and in 1787 to the convention in Philadelphia which framed the Constitution of the United States. He was elected United States Senator in 1789 and again in 1791, but resigned in 1793 to take the position of Chief Justice of Delaware, which he continued to hold until his death. Consult W. T. Read, *Life and Correspondence of George Read* (Philadelphia, 1870).

READ, Sir (Charles) Hercules (1857–). An English archæologist. He was privately educated. In 1880 he became assistant in the British Museum and in 1896 keeper of British and mediæval antiquities there. He wrote important contributions for *Archæologia*, edited *Notes and Queries on Anthropology* (1892), and published *Antiquities from Benin* (1899), *Catalogues of the Waddesdon Bequest* (1899, 1902), and catalogues and guides of various collections in the British Museum.

READ, John Meredith, Jr. (1837–96). An American diplomat and writer. He was born in Philadelphia, graduated at Brown University in 1858 and at the Albany Law School in 1859, and was admitted to the bar. From 1860 to 1866 he was Adjutant-General of New York State and was an active political organizer. In 1869 he was appointed the first United States Consul General to France and Algeria and in 1873 became Minister to Greece. His skill and energy, especially during the critical period following Russia's defeat of Turkey in 1878, earned the thanks of his government. In 1879 he resigned and aided Greece in securing the territory which had been ceded to her by Turkey. In 1881 King George created him a Knight Grand Cross of the Order of the Redeemer, the highest honor in the gift of the Greek government. His later years he spent mostly in Paris, engaged in study and research. He published: *Military Reports and Suggestions* (1861); *Historical Inquiry Concerning Henry Hudson* (1864–66); *Charles Reade at Home* (1873); *The English Ancestry of Washington* (1894); *Historic Studies in Vaud, Berne, and Savoy, from Roman Times to Voltaire, Rousseau, and Gibbon* (?1897).

READ, Nathan (1759–1849). An American inventor. He was born at Warren, Mass., graduated at Harvard in 1781, and was tutor there from 1783 to 1787. In 1788 he conceived the idea of utilizing the steam engine for propelling boats and carriages and, with that end in view, began a series of experiments which resulted in the invention (1789) of the vertical multitubular fire-box boiler (patented Aug. 26, 1791) now in general use. In 1796 he established the Salem Iron Foundry for the manufacture of anchors and chain cables, and in 1798 patented a machine for cutting and heading nails at one operation. He was a member of Congress from 1800 to 1803, and in 1807 removed to the vicinity of Belfast, Me., where he was for some years Chief Justice of the Court of Common Pleas. Consult David Read, *Nathan Read: His Invention of the Multitubular Boiler and Portable High-Pressure Engine* (New York, 1870).

READ, Opie (Percival) (1852–). An American author and editor, born in Nashville, Tenn. He edited the *Arkansas Gazette* in 1878–81 and in 1883 established the *Arkansaw Traveller*, a humorous paper, which he edited until 1891. Thereafter he was engaged in literary work at Chicago. He wrote: *A Kentucky Colonel* (1889); *A Tennessee Judge* (1893); *The Wives of the Prophet* (1894); *An Arkansas Planter* (1896); *Bolanyo* (1897); *Old Ebenezer* (1898); *A Yankee from the West* (1900); *In the Alamo* (1901); *The Starbucks* (1902); *An American in New York* (1905); *Old Jim Lucklin* (1905); *The Son of the Swordmaker* (1905); *The Mystery of Margaret* (1907); *Tom and the Squatter's Son* (1910); *The New Mr. Howerson* (1914).

READ, Thomas Buchanan (1822–72). An American poet and artist, born in Chester Co., Pa. He learned several trades in various cities, in 1843 published newspaper verse in Boston, and devoted himself mostly to painting, visiting Europe several times and finally settling in Rome. He is best known as a poet, especially for his stirring "Sheridan's Ride" and for his verses called "Drifting." His works include: *Poems* (1847); *Lays and Ballads* (1848); *The New Pastoral* (1854), an elaborate description of Pennsylvania life; *The House by the Sea* (1856). In 1848 he compiled *Female Poets of America*, illustrated by engravings of portraits painted by himself. He died in New York. Consult his *Poetical Works* (Philadelphia, 1865; new ed., 3 vols., ib., 1903).

READE, Charles (1814–84). An English novelist and playwright, born at Ipsden House, in Oxfordshire, June 8, 1814. He entered Magdalen College, Oxford, graduating B.A. in 1835 and M.A. in 1838; was elected lay fellow of his college (1835); made dean of arts at Magdalen (1845) and vice president (1851); in the meantime had studied at Lincoln's Inn and was admitted to the bar (1843). Reade never married, but formed a platonic friendship with an actress named Laura Seymour. He passed several years at his rooms in Magdalen, made many tours abroad, but lived mostly in London. Combative by nature, he was engaged in numerous lawsuits. He died at Shepherd's Bush (London), April 11, 1884.

Reade began his literary career as a playwright, and to the end continued to write plays either single-handed or with others. He had great facility in expanding a play into a novel or in reducing a novel to a play. In 1852 *Masks and Faces*, written with Tom Taylor, was brilliantly received at the Haymarket. Reade turned this play into the novel *Peg Woffington* (1853), which was soon followed by the delightful *Christie Johnstone* (1853), having as heroine a Newhaven fisher lass. In 1856 appeared *It Is Never Too Late to Mend*, exposing prison discipline in England and Australia. This novel with a purpose, which created a sensation, was succeeded by *Hard Cash* (1863), dealing with the iniquities of insane asylums; *Griffith Gaunt* (1865), on the marriage problem; *Put Yourself in his Place* (1870), on the terrorism of trade-unions; *A Terrible Temptation* (1871); *A Woman Hater* (1877), in which the degrading conditions of village life are exposed. All these novels are powerfully written. By itself stands Reade's masterpiece, *The Cloister and the Hearth* (1861), an historical romance, having as hero the father of Erasmus and dealing in a wonderfully vivid manner with student and vagabond life in Europe towards the close of the Middle Ages. After Reade's death appeared *The Jilt and Other Tales* (1884) and *Good Stories of Man and Other Animals* (1884).

Reade is not among the greatest novelists. He had not a keen artistic sense. His character drawing is picturesque rather than psychological, and he often develops his situations in a highly sensational way. But he always had a story to tell, and takes a secure place among his contemporary novelists of the second rank. Consult: Compton Reade, *Charles Reade: A Memoir* (London, 1887); John Coleman, *Charles Reade as I Knew him* (ib., 1903); and for a cordial estimate, A. C. Swinburne, *Miscellanies* (ib., 1886).

READE, JOHN (1837–). A Canadian journalist and author. He was born in Ballyshannon, Ireland, was educated at Queen's College, Belfast, and in 1856 went to Canada, where he established the *Montreal Literary Magazine*. In 1864 he was ordained to the ministry of the Church of England, but after a few years' service in the Eastern Townships returned to Montreal and later relinquished the ministry. In 1870 he became literary and general assistant editor of the Montreal *Gazette*. He was appointed in 1882 one of the original fellows of the Royal Society of Canada, and was elected president of the Society of Canadian Literature and in 1896 a fellow of the Royal Society of Literature of Great Britain. Apart from his journalistic work he was a close student of philology, ethnology, and folklore. His writings include: *The Prophecy of Merlin and Other Poems* (1870); *Language and Conquest* (1883); *The Making of Canada* (1885); *Literary Faculty of the Native Races of America* (1885); *The Half-Breed* (1886); *Vita sine Literis* (1886); *Aboriginal American Poetry* (1887); *Some Wabanaki Songs* (1888); *The Basques in British North America* (1889). Excepting the volume of poems, all these publications first appeared in the *Transactions of the Royal Society of Canada*. He edited a memorial volume of the *Poems* of George Murray in 1912.

READER (from *read*, AS. *rædan*, Goth. *rēdan*, OHG. *rātan*, Ger. *raten*, to counsel, advise; connected either with Lat. *reri*, to think, or with OChurch Slav. *raditi*, to be anxious for, Lith. *rodas*, willing, Skt. *rādh*, to be successful), or LECTOR. The title of the second among the four minor orders of the Roman Catholic church, designating a class whose duty it was originally to read the lessons (q.v.) of Holy Scripture in public worship. Traces of their existence as a distinct clerical class are found as early as Justin Martyr, Tertullian, and Cyprian. By present usage, however, the office is nothing more than a formal step to the priesthood. Consult Adolf Harnack, "Ueber den Ursprung des Lectorals und der anderen niederen Weihen," in *Texte und Untersuchungen*, vol. iv (Leipzig, 1886). See also LAY READER.

READING, rĕd′ĭng. A municipal, parliamentary, and county borough, the capital of Berkshire, England, on the Kennet, near its confluence with the Thames, 36 miles west of London (Map: England, F 5). The town is irregular in plan, but well built, and has fine buildings which include a municipal block with two town halls, clock tower, free library, valuable museum, concert hall, etc. Other buildings are the assize courts, the grammar school, founded in 1445, University College, and Sutton's Abbey Hall. Reading has interesting churches and the remains of a magnificent Benedictine abbey, founded in 1121 by Henry I, whose burial place it became. Of its three parks the Palmer Park forms a fine recreation ground. The town owns valuable real estate, water, abattoirs, and markets, maintains bathing places, libraries, museum, art gallery, sewage farm, and provides technical instruction. It has an important trade in corn and agricultural produce; there are also famous seed farms and biscuit manufactories, iron works and foundries, breweries, and manufactures of silks, ribbons, velvets, paper, and sauce. The town was of importance in 871, when the Danes made it their headquarters. Domesday mentions it as Radynges. Stephen built a castle, which was destroyed by Henry II. Nine parliaments were held within the abbey, which Henry VIII converted into a palace. In 1643 Reading surrendered to the Parliamentarians, who destroyed the abbey palace. Pop., 1901, 72,214; 1911, 75,214. Consult Jones, *Sketches of Reading: Historical, Archæological, and Descriptive* (Reading, 1870).

READING. A town in Middlesex Co., Mass., 12 miles north of Boston, on the Boston and Maine Railroad (Map: Massachusetts, E 2). Chiefly a residential town, it has a public library and manufactures of organ pipes, carriages, boots and shoes, shoe stock, rubber, rubber cloth, imitation leather, games, and wire brushes. Reading was settled in 1638 and was incorporated in 1644. Pop., 1900, 4969; 1910, 5818.

READING. A village in Hamilton Co., Ohio, 15 miles by rail from Cincinnati, on the Pittsburgh, Cincinnati, Chicago, and St. Louis Railroad. It has a convent of the Sisters of Notre Dame. The chief manufactures are bottles, fireworks, cigars, etc. Pop., 1900, 3076; 1910, 3985.

READING. A city and the county seat of Berks Co., Pa., 58 miles northwest of Philadelphia, on the Schuylkill River and the Schuylkill Canal and on the Philadelphia and Reading and the Pennsylvania railroads (Map: Pennsylvania, K 7). The city of Reading covers an area of about 6 square miles and is regularly laid out, having 89 miles of paved streets. The public park system comprises 295 acres. The summits of Mount Penn, to the east, and the Neversink Mountain to the south of the city, which afford magnificent views, are reached by inclined electric railways. Noteworthy features include the county courthouse, city hall, opera houses, museum and art gallery, Y. M. C. A., Schuylkill Seminary, natatorium, Y. W. C. A., high school for boys, which cost $400,000, the girls' high school building, Masonic Temple, public and Berks County law libraries, and the Reading, Homœopathic, and St. Joseph's hospitals. The annual county fair is held here, handsome grounds and a race track being maintained by the association north of the city. Reading is situated in a rich agricultural district, the chief products of which are apples, corn, wheat, oats, rye, potatoes, forage, and vegetables; it is also quite important as a manufacturing centre. In the year 1914 an aggregate capital of $45,334,000 was invested in the various industries, which had an output valued at $53,232,000. The manufacturing establishments numbered 486, and these employed 26,801 persons, of whom 24,185 were wage earners. There are extensive shops of the Philadelphia and Reading Railroad and the Reading Iron Company, large iron and steel works, and machine shops, breweries, and manufactories of hardware, brick, cigars, hosiery, knit goods, hats, carriages, spectacles, boots and shoes, confectionery, woolen, worsted, and felt goods, and paper.

Since 1913 the government has been vested in a commission chosen every two years. The school board of nine members is chosen by popular vote. The city in 1913 had a net debt of $1,917,000; and the assessed valuation of property (real and personal) was $56,241,000. For maintenance and operation there was spent in the same year $899,000, the main items being $318,000 for schools, $82,000 for the water department, $137,000 for streets, $88,000 for the police department, $68,000 for the fire department, and $80,000 for sanitation. The water works, which were constructed at an expenditure of $2,757,249, are owned by the municipality. Laid out in 1748 and settled mostly by Germans, Reading (named from Reading, England) was incorporated as a borough in 1783, its population then being 2100, and in 1847, with a population of about 12,000, it was chartered as a city. Its boundaries were extended in 1867 and 1869. Pop., 1890, 58,661; 1900, 78,961; 1910, 96,071; 1915 (U. S. est.), 107,594.

READING, rēd′ĭng. The process of conveying to the mind by sight written or printed words or symbols. Almost as commonly the word refers to the vocal expression of that which written or printed symbols are intended to convey. Still more broadly "reading" is used to designate the art of speaking to an audience what has been composed by another.

The oldest method of teaching reading and the one that has been most widely followed is the alphabetic or synthetic method. By this a pupil first learns to identify the letters of an alphabet with certain sounds and then to group these sounds in such a way as to produce others which stand for mental images. In the sixteenth century Ickelsamer, the publisher of a German primer, pointed out that the sounds representing letters only confused the beginner when he tried to combine them into words; but it was not until the latter part of the eighteenth century that any other method was able really to establish its claim to superiority. Since then the analytic method, usually subdivided into the look-and-say or word method and the syllabic method, has been constantly growing in favor. By this pupils are first taught to associate a mental image with a single word or combination of words, and only later to analyze these combinations into their phonetic or alphabetic elements.

Bibliography. Kehr, *Praxis der Volksschule* (10th ed., Gotha, 1885); id., *Geschichte des Leseunterrichts* (ib., 1889); Laurie, *Language and Linguistic Method* (London, 1893); B. A. Hinsdale, *Teaching the Language Arts* (New York, 1896); Arlo Bates, *Talks on the Study of Literature* (Boston, 1897); G. S. Hall, *How to Teach Reading* (ib., 1897); S. L. Arnold, *Reading: How to Teach it* (ib., 1899); Percival Chubb, *The Teaching of English* (New York, 1902); Carpenter, Baker, and Scott, *The Teaching of English* (ib., 1903); E. B. Husy, *The Psychology and Pedagogy of Reading* (ib., 1908); S. H. Clark, *How to Teach Reading in the Public Schools* (Chicago, 1908).

READING (rĕd′ĭng) **OF EARLEY**, Rufus Isaacs, first Baron (1860–). An English lawyer and jurist, of Jewish descent. He was born in London, the son of a successful fruit merchant, and was educated at University College School, London, and in Brussels and Hanover. For a time he was a seaman on a coal ship running to Rio de Janeiro, was his father's agent in Magdeburg, and finally studied law. In 1898, 11 years after he was called to the bar, he became a queen's counsel, and soon afterward was considered a leader of the English bar. He was elected to the House of Commons as a Liberal from Reading in 1904. Early in 1910 he was named Solicitor-General, and in the autumn of the same year Attorney-General. His part in the libel suit against Edward Mylius, who had accused King George V of an early secret marriage, won Isaacs royal favor. He had been knighted in 1910 and had a high reputation as an eminently fair attorney, with a remarkable mastery of financial and technical detail and great ability as a cross-examiner. In June, 1912, he received a seat in the cabinet, being the first Attorney-General to be so honored. Like Chancellor Lloyd-George, he was accused of speculation in Marconi stock, admitted the charge, and seemed to lose nothing in political prestige. He was one of the foremost defenders of the Liberal financial policy in the Home Rule Bill of 1913. Late in that year he was made Lord Chief Justice and in the New Year's honors for 1914 was elevated to the peerage. In 1915 he went to the United States as head of the Anglo-French Commission which arranged for the American loan of $500,000,000 to the allies. Consult A. G. Gardiner, *Prophets, Priests, and Kings* (London, 1908).

READJUST′ERS, or Refunders. The name applied to a political party in Virginia, from 1878 to 1885, which favored the readjustment or scaling down of the State debt. At the close of the Civil War the public debt of Virginia amounted to about $41,000,000, which was increased by the extravagance and corruption of the reconstruction governments. On account of the general impoverishment of the time, the interest account could not be met, although the rate of taxation had been enormously increased. An Act of 1870–71 to refund the debt was repealed in the following year, but the repealing Act was not sustained by the courts. Still the arrears of interest increased, and by 1878 the State was pretty well divided between debt payers and readjusters. During that year the Legislature passed the McCulloch Bill, which provided for the issue of new bonds to be exchanged for outstanding bonds dollar for dollar and to bear interest at 3 per cent for 10 years 4 per cent for 20 years, and 5 per cent for 10 years, making an average of 4 per cent for 40 years. The readjusters organized themselves into a political party and succeeded in gaining a majority of the seats in both Houses of the Legislature. Their leader was H. H. Riddleberger, who won notoriety by his bill declaring that the State ought not to pay any part of the interest upon the public debt which had accrued during the Civil War and the period of reconstruction. The bill proposed to scale down the public debt from $31,102,571 to $19,665,196 and to devote to its payment only that portion of the State revenues for which no other use could be found. The bill passed both Houses of the Legislature, but was vetoed by the Governor. In the State election of 1881 the readjusters, with the help of the Republicans, defeated the Conservative Democratic party, which approved the McCulloch Bill. The readjusters now passed three important measures. The first two, popularly known as coupon killers, were designed to prevent the payment of State taxes by means of coupons from bonds issued in pursuance of the McCulloch Act and the Act of 1871. The third measure was substantially the Riddleberger bill reënacted. The majority of the bondholders refused to accept the settlement and tested the constitutionality of the coupon-killer acts in the courts. In nine decisions, generally known as the Virginian Coupon Cases, the United States Supreme Court declared in substance that the later Act forbidding the receipt in payment of taxes of those coupons which were received under the Act of 1871 was an impairment of the obligation of contracts in conflict with the Constitution of the United States and therefore void. In the legislative session of 1884, before the final decision was made, several acts were passed for the purpose of rendering the coupons worthless, and in the sessions of 1886 and 1887 still further attempts of this kind were made. Afterward a final settlement in the nature of a compromise between the State and the bondholders was effected, and the long-continued controversy over the debt question seemed to come to an end. Consult W. A. Scott, *The Repudiation of State Debts* (New York, 1893).

REAGAN, rē′gan, JOHN HENNINGER (1818–1905). An American statesman, born in Sevier Co., Tenn. In 1839 he removed to the Republic of Texas and settled east of the Brazos. He was admitted to the bar in 1846 and from 1852 to 1857 was judge of the Ninth Judicial District. From 1857 to 1861 he was a member of Congress, but resigned to serve as delegate to the Texas Secession Convention, by which he was elected a deputy to the provisional Congress of the Confederate States. During the Civil War he was Postmaster-General of the Confederacy, and in 1865 he was also acting Secretary of the Treasury. Captured with Jefferson Davis, May 10, 1865, Reagan was confined in Fort Warren until October. While in prison he wrote the celebrated *Fort Warren Letter* to the people of Texas, advising them to confer civil rights upon the negro and admit the more intelligent to the suffrage, lest worse and more radical measures should follow. This was misconstrued and subjected him to much harsh criticism in the State. From 1875 to 1887 he was a member of Congress, and for 10 years he was chairman of the Committee on Commerce. He was one of the authors of the Cullom-Reagan Interstate Commerce Act, which became law in 1887. In that year he was elected United States Senator but resigned in 1891 to become chairman of the Texas State Railroad Commission.

REAL, CORTE. See CORTE-REAL.

REAL ACTION. Under the common-law system of pleading, an action brought for the recovery of real property. A real action may be based merely on the right of possession, as where a tenant under a lease is ejected and seeks to recover back possession, in which case it is classed as *possessory;* or it may be based on right of title in the property, as where an heir claims real estate by inheritance, in which case the action is said to be *droitural*. A real action was begun by a writ. Thus, a possessory real action was begun by a writ of entry or writ of assize, whereas a droitural real action was commenced by a writ of right, writ of formedon, or writ of dower, according to the nature of the right or title involved. A real action was distinguished from a mixed action by the fact that in the latter damages could be recovered.

The old forms of real actions have been superseded in all jurisdictions by the more modern action of ejectment, and in code States by statutory proceedings to recover real property. See ACTION; EJECTMENT; FORMS OF ACTION.

REAL DE LOS ALAMOS. See ALAMOS.

REAL ESTATE. Land, together with such growing crops, trees, etc., and improvements thereon as are considered to be a part of and pass with it, or any interest in land greater than a term of years. In general, all movables and interests in land less than a freehold are called personal property to distinguish them from the above. Real estate descends to the heirs of a deceased owner and is subject to dower and curtesy. Greater formalities are required to convey or incumber real estate than are necessary in dealing with personal property. The terms "real estate" and "real property" are used interchangeably. For a further discussion of the rules of law applicable thereto, see ESTATE; PROPERTY; REAL PROPERTY. Consult: Sir William Blackstone, *Commentaries* (4th ed., 2 vols., Chicago, 1899); Emory Washburn, *American Law of Real Property* (6th ed., 3 vols., ib., 1902); S. M. Leake, *Elementary Digest of the Law of Property in Land* (2d ed., Toronto, 1909).

REALGAR, rē-ăl′gar (from Ar. *rahj al ghār*, powder of the mine, mineral powder). A mineral arsenic monosulphide that crystallizes in the monoclinic system and is of a red or orange-yellow color, with a resinous lustre, and is generally translucent, though sometimes transparent. It occurs with lead and silver ores. Realgar was formerly somewhat used as a pigment; it is also called red orpiment, or ruby sulphur.

REALGYMNASIA, rȧ-äl′gĭm-nä′zĭ-ȧ. See GYMNASIA.

REALI DI FRANCIA, rȧ-ä′lė dė frän′chȧ, I (It., The Royal Men of France). A chivalric romance attributed to Andrea da Barberino and therefore of about the end of the fourteenth or the beginning of the fifteenth century. It is a legendary account of the kings of France, from their supposed Roman origin in Constantius, the banished son of Constantine the Great, down to Charlemagne. Consult the critical edition of the *Reali* by Vandelli (Bologna, 1892), and P. Rajna, *Ricerche intorno ai Reali di Francia* (Bologna, 1872).

REALISM. In philosophy, a term used to denote (1) the mediæval metaphysical theory that universals have an existence independent of individual objects (see NOMINALISM); and (2) the metaphysical view that there are realities which have an existence independent of conscious experiences; opposed to idealism (q.v.).

In the second meaning of the term realism in an unreflective form is the view taken by the ordinary man in societies which have outgrown primitive animism, and it has been the prevailing philosophy in Europe since reflection began with Thales. Practically all Greek philosophy, with the questionable exception of the sophists and the skeptics, were realists, although the kind of reals which they assumed varied greatly. Mediæval philosophy was also diversifiedly realistic, and modern philosophy began with a realistic bias. Indeed, idealism did not find clear expression till Collier, Berkeley, and Malebranche developed it; but since the beginning of the eighteenth century it has been increasingly popular in philosophical circles, most of the great names in philosophy being identified with idealism, with the notable exception of Kant, who stoutly held to the belief in unknowable things-in-themselves, of the materialists, and of the Scottish philosophers led by Reid; in Germany Herbart and his school should also be mentioned as realistic.

The explanation of the modern switching of philosophers from realism to idealism is largely to be found in the fact that our knowledge of things varies with the physiological changes in the human body, ultimately with the brain changes. Everything known seems to be a mere function of the brain, and likewise the fact of knowing itself seems so to vary. Now, calling everything that appears in experience ideal, it would seem that whatever is assumed to lie outside of any experience is merely an *ideal* assumption, i.e., the very assumption is just nothing but a fact within some experience. Even the brain of the experient is his own assumption and is ideal. There is nothing but conscious experiences and their conscious contents. Such is the bald conclusion drawn by idealism in its earlier stages. This conclusion was modified in more developed forms of idealism (q.v.). Against such reasoning realism held its own only by reliance upon intuition as furnishing indubitable evidence of the existence of things independent of experience. In other words, realism could be only a *faith*, protesting against the rigid conclusions of idealism. This was, e.g., the type of realism found in Reid. We have intuitive certainty that there are realities which we cannot intuit. Realism of this type was a form of anti-intellectualism, a revolt against rigorous logic, with an appeal to a higher court.

Neorealism. The beginning of the twentieth century brings another form of realism, which is distinguished from the older in that it is more radical. Its radicalism is expressed in its declining to accept the premise from which idealism started, viz., that whatever appears in experience is ipso facto intrinsically experiential, i.e., that it can only be what it is in the kind of experience in which it appears. This can be made more clear by calling attention to the dualistic nature of the earlier realism, which believed in transexperiential realities, but, with idealism, denied that such realities ever actually enter into experience, being only *represented* therein by some experiential surrogate. Thus, everything in experience for this older realism is just as intrinsically experiential in its nature as the idealists maintained it to be; but in addition to this experiential reality realism maintained the existence of another kind of reality which lies unattainably beyond any human experience, like Kant's things-in-themselves. The new realism is not *fundamentally* and "epistemologically" dualistic; it begins with the assumption that the things in experience, or at least some of them, are just the very things which exist outside of experience. This assumption would be difficult or impossible if experience were considered as an affection of a substantial *mind*, such as the older realism held it to be; for how can one independent thing be or become a state of another independent thing? But this assumption of a substantial mind was gradually outgrown by idealism itself in its later developments and was definitively discarded by William James, when he startled the philosophical world by the denial that even consciousness exists as an independent entity. Consciousness as entity is, according to James, nothing but "the faint rumor left behind by the disappearing 'soul' upon the air of philosophy." Consciousness is only a *relation:* thus was launched the now much discussed "relational theory" of consciousness, but not as a floater for realism.

But if consciousness is nothing but a relation there is no reason why things that are "in consciousness" should not also have an existence at other times "outside of consciousness," much in the same manner in which two persons standing to each other in the relation of mutual love may have previously been independent of this relation and may even survive the extinction of this relation. Thus, the relational theory of consciousness made possible the development of a realism without a substantial mind and without the special difficulties of the older realism born of its union with such a substantial mind. But this new realism has difficulties of its own, which it tries to meet in various ways according to the temper and habits of the individual realist. One of these difficulties is the precise identification of the consciousness relation; on this point there is much divergence of view. Another is whether the consciousness relation is merely "external," i.e., whether it makes any *difference* to the things related. On this matter there is also difference of opinion. Another difficulty is concerned with the so-called belatedness of perception: we never perceive things at just the exact instant in which they exist as perceived. Perception is just a little behind time always, sometimes quite out of date, as in the case of the perception of a distant star, which may have been extinct years before the date of our perceiving it. But how can a thing which is past yet now be present in a relation? Still a fourth difficulty concerns the status of illusions and mistakes of all sorts. If what we see when we look at a real house is something that existed unseen before we saw it, what about the things we see when we have an hallucination? These and various other difficulties are being attacked by neorealism, with success or failure according to the standpoint of the critic. Appearances seem to indicate that the neorealistic movement is gaining ground, but it is either vigorously attacked or ignored by the idealists, and it is sometimes in alliance with and sometimes opposed by pragmatism. With a liberal interpretation of the term "realism" perhaps all pragmatists are realists, but many of them are strenuously attacking the specific forms of neorealism proposed by neorealists, and the outcome of the whole discussion is still a matter of the future. Realism may claim along with pragmatism to have introduced new life into philosophical interests.

Among the new realists mention may be made of Bertrand Russell, G. E. Moore, R. B. Perry, E. B. Holt, F. J. W. Woodbridge, W. P. Montague, W. T. Marvin, W. B. Pitkin, E. G. Spaulding, G. S. Fullerton, J. E. Boodin, and E. B. McGilvary. See KNOWLEDGE, THEORY OF; METAPHYSICS.

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REALISM AND NATURALISM. The doctrine of a school of novelists who opposed and still oppose idealism or romanticism. Realism soon spread throughout Europe and the United States. Although we technically apply realistic to a nineteenth-century school of writers, realism may be traced back through the ages. We find it in Boccaccio and in Chaucer, in the picaresque novels of Spain, in Nash, in Voltaire, and in Richardson, still more in Fielding, Smollett, and Defoe, each of whom intended to produce illusions of actual everyday life or reality in exceptional phases. Each of these writers is quite as realistic in the main as the authors of *Madame Bovary* and of *Une vie*. The early modern realists were at last submerged in romanticism.

The romantic school had regarded the function of the novelist as one of the imagination. His task was to imagine a series of incidents more or less probable and a set of characters more or less heroic or unusual. His world was in many respects an ideal world. The idealist, who has always existed, wishes for his part to choose beautiful themes, to improve on men—one might almost say, to make angels out of them at times—in a word, to paint things not as they are, but as the idealist would have them. Poets have lived in a dream world oftener than writers of prose. Fairy tales are mostly idealistic, even when their personages are witches and goblins, for such beings are merely, if such a thing is possible, idealizations of evil. Realism is avowedly closest to nature; romanticism clings to nature in spirit, perhaps, but cares little for detail and is fond of the exotic, the remote, the strange, the mysterious, as contrasted with near and familiar things on the levels of ordinary life. A romantic idealism, in one acceptation of the word, presents people who are preternaturally beautiful or good or bold or even wicked, whose conversations sparkle with epigrams, whose main business, in fine, is not closely related to the everyday world or to average truth. But realism, naturalism, romanticism, and idealism—vague words, to say the least—are all only nature reflected by various mirrors held up to her in countless ways. Each denotes a tendency stronger at one period than at another, and the tendency is never hard to feel, yet always too subtle, too shifting, to be defined. Again, the realism of literature in another phase is the realism of sculpture and the graphic arts. The extreme realists conceive of the vocation of the novelist as that of an accurate reporter of what he has carefully observed in the everyday life of the world about him. Fancy, they say, hinders this exact reproduction of truth, for the realistic school deals only with facts. To it nothing is too trivial or too commonplace or too unpleasant to be recorded. In a word, "any corner of nature," if accurately depicted, will be profoundly interesting.

The progenitor of this school is said by the French nineteenth-century realists themselves to have been Rousseau, who in his *Confessions* adopted the plan of setting forth minutely the exact details of his life, concealing nothing, not even those incidents that were in the highest degree discreditable and shameful. But Rousseau merely furnished the suggestion of the tremendous force that lies in outspoken truth and did not himself apply the theory to fiction. This was done by Marie Henri Beyle (1783–1842), better known by his pseudonym Stendhal (q.v.), who, in his novels *Armance, Le rouge et le noir*, and *La chartreuse de Parme*, developed a process of ruthless vivisection based on observation of social and physiological phenomena. The realistic method was carried out on a grand scale by Honoré de Balzac (q.v.) in his *Comédie humaine.* In this marvelous series of works Balzac attempted to delineate the entire life of his time, extenuating nothing, glozing over nothing, but setting forth motive and action with minute fidelity to truth. The discrepancy between Balzac's theories and his practice is obvious to those who would hold him to his word. Closely following him came Gustave Flaubert (q.v.), whose *Madame Bovary* (1857) achieved forthwith a great success and as great a scandal. It was a study of provincial life, as unsparing as any study of Balzac's, but superior in style. Joris-Karl Huysmans (1848–1907) (q.v.) pushed realism to extreme lengths, choosing subjects and scenes that are usually banished from polite society, and his *Marthe* (1876), which was too crude for even the indulgent censorship of modern France, may be taken as a sublimated type of the naturalistic, as distinct from the merely realistic, novels.

The naturalists of fiction are realists and something more. They profess to derive from Stendhal through Balzac and Flaubert. That is to say, they adopt the analytic method and devote themselves chiefly to the study of character. But they go further and object to the processes of art. According to them, literature, to be strictly "scientific," is comparable, not with painting or drawing, but with anatomy and dissection. It is worth our while to observe that the so-called Realistic and then the Naturalistic school rose with, or after, the great rise of experimental science in the early years of the nineteenth century. Yet few genuine scientists would admit the scientific pretensions of the most conscientious realists or naturalists; for, even when their science is not imaginary or the work of dabblers, it is necessarily perverted or modified so as to give a continuous picture of life. No biologist, psychologist, or any other scientist, save the linguist, would think of looking for trustworthy observations in the works of realistic or naturalistic novelists. Unfortunately, too, the extreme Realistic school, and later the naturalistic writers, sought their material in the baser walks of life, for they found little in the humdrum existence of decent mediocrity wherewith to stir their readers. True, some realists asserted that "truth" (meaning their observations) is never dull, and it must be confessed that the Goncourts combined to "report" with extraordinary interest, and often charmingly, many scenes which at first blush would be called dull and unsuggestive; but this result was achieved by dint of talent, which found a hundred new thoughts in relations and presented them with skill. If, however, we were to gather statistics from the more modern Realistic school, especially in the Romanic countries, we should almost certainly find that the school called Realistic has dealt rather slanderously with the national life. It has dwelt on freakish or morbid themes and has made its appeal to the beast in man. On the other hand, it has served to awaken readers to the falsehoods or to the fatuous aspects of the Romantic and Idealistic schools. But there are no hard and fast boundaries. Zola is often romantic; Victor Hugo is often realistic. Realism is a tendency in authorship and not a definite province in literature. In England the later realists had their greatest representatives in Thackeray, Dickens, and George Eliot. Here, again, it may be said that the most consistently realistic of these, George Eliot, was closely affiliated with experimental scientists, just as was the case in France. But English realism was never extreme. It has not wallowed; it has not treated its fictitious personages with the cynical scorn of the French school. It has had no Zola to be repudiated by his "master" Taine. Realism, however, took a firm foothold in England. Thackeray and George Eliot have been followed by George Meredith, Thomas Hardy, George Moore, John Galsworthy, and, in his novels of social life and its problems, H. G. Wells, and by W. D. Howells in the United States.

Those whom we are wont to reckon in the Realistic school are novelists or tellers of short tales. Their object ostensibly is to observe, analyze, and describe the actions of others, or their thoughts as uttered or it may be only as implied. This condition requires imagination; for fragmentary manifestations in other beings must be supplemented by the experiences of the author in order to make a continuous narrative. If now we turn to the diarist and the autobiographer, we shall find that realistic portrayal is not thus hampered; for the diarist and the autobiographer find a ready-made continuity in their own experience. Fancy is not a necessary factor of their art. Hence Pepys is a realist of the first order; so, too, is Benvenuto Cellini; nor need we wonder that the French Realistic school discovered a prototype, if not a pattern, in Jean Jacques Rousseau.

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REAL PROPERTY. In the artificial classification of property rights adopted by the English and American law, real property comprehends the larger part of the rights (those, viz., known as "freehold" interests) in land, together with a limited number of other rights which have, for one reason or another, been subjected to the same rules of law. The most important of the latter are certain "incorporeal" interests, as they are called, such as hereditary offices, titles of honor, franchises, annuities, tithes, and the like; while, on the other hand, not a few interests in land, such as leaseholds, mortgages, and certain other creditor's estates, have, for historical or practical reasons, found their place in the rival category of personal property. The famous expression, "lands, tenements, and hereditaments," usually employed as an exhaustive description of real-property rights, is thus an inaccurate statement of such rights, certain landed interests, as has been seen, not being included in the description of real property, while other forms of such property, as heirlooms and the "incorporeal" interests above referred to, not being in the feudal sense "held" of a superior lord, cannot be described as tenements. The term "hereditament," alone, has come to represent all the varieties of property known as "real," and to be in a sense coextensive in meaning with that class of interests, as they all have the common quality of heritability. Indeed, from the conception of heritability as a quality or incident of estates in real property, we have, by a curious process of inversion, arrived at the notion of real property as anything capable of inheritance and have included in the category of real property many classes of rights having nothing to do with land, for no better reason than that, by local custom or otherwise, they descend, like freehold estates in land, to the heir of the possessor.

The ordinary division of real property into "corporeal" and "incorporeal hereditaments" has been considered in the general discussion of property rights. (See PROPERTY.) Though not free from objection, it may be taken as a convenient description of such interests in land as rest on possession and such as do not involve possession respectively. The former comprise the so-called freehold estates of possession (fee simple, fee tail, and life estates), and the latter all future estates (as remainders, reversions, and the like), a great variety of equitable interests in land (of which the most important are trusts and equities of redemption), and the large class of interests in the land of others, known as easements and profits.

The feudal origin of our real-property law and the strange conception derived therefrom that lands are not, like chattels, susceptible of absolute ownership, but only of tenure and of the qualified ownership described by the term "estate," has been considered elsewhere. (See Estate; Fee; Property.) It remains to be noted that incorporeal as well as corporeal hereditaments are subject to be "held" as estates rather than owned outright, and that there may as well be a fee simple, a fee tail, or a life estate in a remainder, a trust, or an easement as in the visible land with which all of these terms are concerned. The difference between the two classes of hereditaments lies rather in the processes by which they may be acquired and transferred. Both descend to the same heir upon the same event, and both are alike subject to the free power of alienation, but the nature of the one renders it incapable of seisin or possession and therefore alienable by the ancient process of livery of seisin, wherefore it "lies in grant," i.e., is transferable only by deed. Our modern instrument of conveyance is merely the ancient deed of grant, originally appropriated to the incorporeal hereditament, but now employed for the alienation of corporeal property as well. See Alienation; Deed; Grant; Hereditament.

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REALSCHULE, rȧ-äl′shōō′le. A German school of secondary instruction, differing from the Gymnasium inasmuch as it offers no instruction in the classical languages and lays stress on science. The Realschule is an outgrowth of the realistic tendencies of the seventeenth and eighteenth centuries. The institutions that Francke established at Halle towards the close of the seventeenth century laid unusual stress on the study of nature. At the same time notable efforts were being made to introduce more science into the classical schools generally. In 1747 Hecker established at Berlin an ökonomischmathematische Realschule, which may be regarded as the prototype of the Realschule of to-day. It gave instruction in the German, French, and Latin languages, in writing, arithmetic, drawing, history, geography, the elements of geometry, mechanics, and architecture, and in religion and ethics. Some optional study of occupations and trades also was provided.

The Realschule of to-day has a six years' course, and its graduates go directly into business life. Those who wish to take the university courses in science and mathematics attend the *Oberrealschule*, which has a nine years' course. The programme in this school is like that in the Realgymnasium, with the exception of the omission of Latin and the substitution therefor of more work in mathematics, natural history, chemistry, mineralogy, French, and English. Graduates of these two types of schools are regarded as on the same plane educationally, but both are regarded as somewhat inferior to the graduates of the Gymnasium. The Realschule grants to its graduates only one of the secondary-school privileges, that of the *Einjährig Freiwilliger*, or military service for one year with certain privileges. Consult F. E. Bolton, *Secondary School System of Germany* (New York, 1900), and J. E. Russell, *German Higher Schools* (ib., 1907). See Gymnasia and Realgymnasia; National Education.

REAM, Norman Bruce (1844–1915). An American capitalist, born in Somerset Co., Pa. He served as private and lieutenant in the Eighty-fifth Pennsylvania Volunteers during part of the Civil War, was engaged in business at Princeton, Ill., and at Osceola, Iowa, between 1866 and 1871, and was afterward a live-stock and grain-commission merchant in Chicago until 1888. The foundation of his fortune was laid in the great Armour pork corner in 1879, Ream acting as one of the Armour brokers. In 1883 he formed one of the "Big Four" combination that bolstered up the tottering grain market. Two years later he became a member of the New York Stock Exchange. Ream was one of the organizers of the National Biscuit Company and of the United States Steel Corporation and at the time of his death possessed extensive interests in railroads, banks, and Chicago real estate.

REAM, Vinnie. See Hoxie, Vinnie Ream.

REAPERS, REAPING (from *reap*, AS. *rīpan*, to reap; connected with OHG. *rifi*, Ger. *reif*, AS. *rīpe*, Eng. *ripe*). The first implement used for reaping was the reaping hook or sickle, dating from the Stone and Bronze ages (Fig. 1, *a, b, c, d*). Records of this implement are found in Egyptian history 1400–1500 B.C. The earliest form of the sickle had a slightly curved blade with straight handle; later the blade was toothed or serrated, and its form approached that of the modern sickle. As a rule, the edge was made plain and sharp like a knife. The ancient Jews used a sickle of the Egyptian form. In China and Japan to-day are found sickles of much the same form as those which have been used there from time immemorial. The Greeks and Romans used smooth-bladed sickles or a

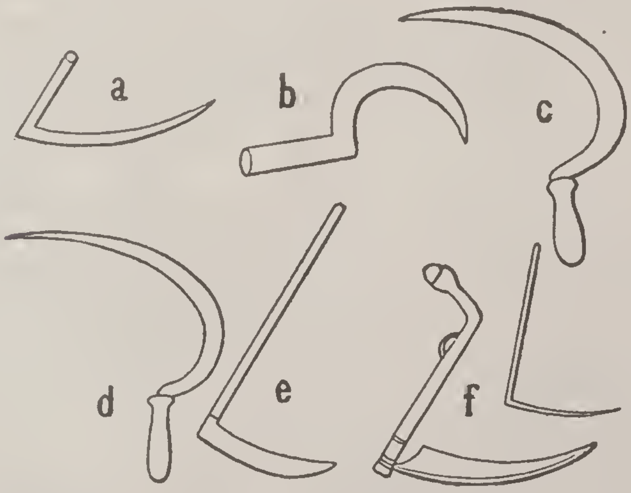

Fig. 1. various forms of sickles and scythes.

sickle with toothed blade attached to a curved stick. The latter also used a small hooked knife resembling a pruning hook. The scythe (Fig. 1, *e*, *f*) followed the sickle and was apparently introduced by the Romans, by whom it was employed mainly for cutting grass. Pliny, in his writings, distinguishes between the sickle and the scythe, and Crescenzio described both in 1548. At first the scythe was intermediate in construction between the sickle and the modern scythe, as in the Hainault scythe (Fig. 1, *f*), which is operated with the right hand while the grain is gathered with a hook in the left hand. In time the blade became lighter and the handle underwent numerous changes in form and material until the modern crooked wooden pattern was evolved. The next step was the fastening of fingers (one to four) to the scythe parallel with the blade, thus evolving the so-called cradle scythe (Fig. 2, *a*). The fingers were at first made shorter than the blade, and the operator cut towards, and left the cut grain leaning against, the standing grain. The Americans made improvements in these old forms and developed the American cradle scythe or cradle (Fig. 2, *b*) about the period from 1776 to 1800. This implement was in universal use in America at the beginning of the nineteenth century. It is now employed in the United States only where the use of reaping machines is impracticable, although still used to a considerable extent in many other countries. Both sickle and scythe are widely useful agricultural implements.

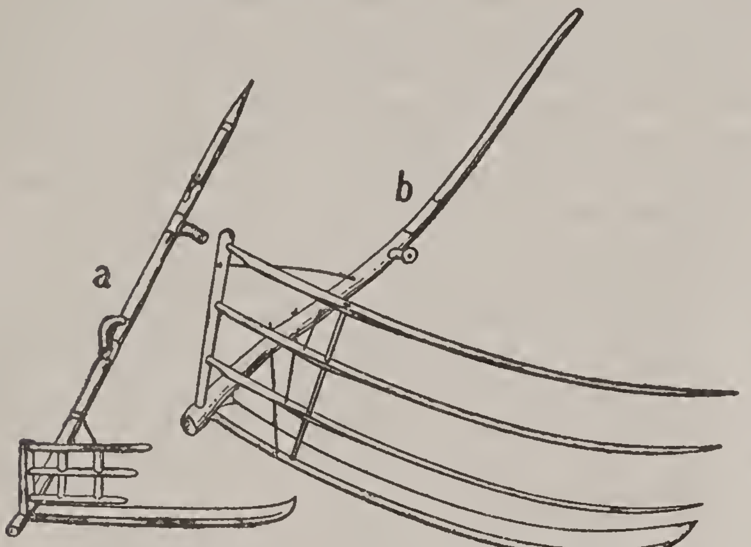

Fig. 2. FORMS OF CRADLE SCYTHES.

The first reaping machine recorded in history is the Gallic header (Fig. 3) mentioned by Pliny (23 A.D.) as used in the extensive fields of the lowlands of Gaul. This consisted of a large box with projecting teeth along its front edge, which was pushed through the grain by an ox hitched in rear. The heads were caught and torn off by the teeth and were raked into the box by an attendant. This machine, however, was forgotten for ages. During the latter part of the eighteenth and the early part of the nineteenth centuries a number of machines, including especially those of Gladstone (1806) and Salmon of Woburn (1807), were invented and given trial in England, but little practical progress was made until 1822, when Henry Ogle brought out his side-draft machine (Fig. 4), with reels, reciprocating knife (straight-edged) over stationary fingers, dividers, and platform, thus foreshadowing the essential features of the modern reaper. In 1827 Patrick Bell invented a machine which was used with considerable success in England and Scotland. Its cutter worked on the shear principle. The cut grain was carried to one side by means of revolving rollers. It had reels and dividers and was pushed through the grain by a team hitched in the rear. This machine, although built on wrong principles, is important because it was simple in construction and fairly efficient in practice.

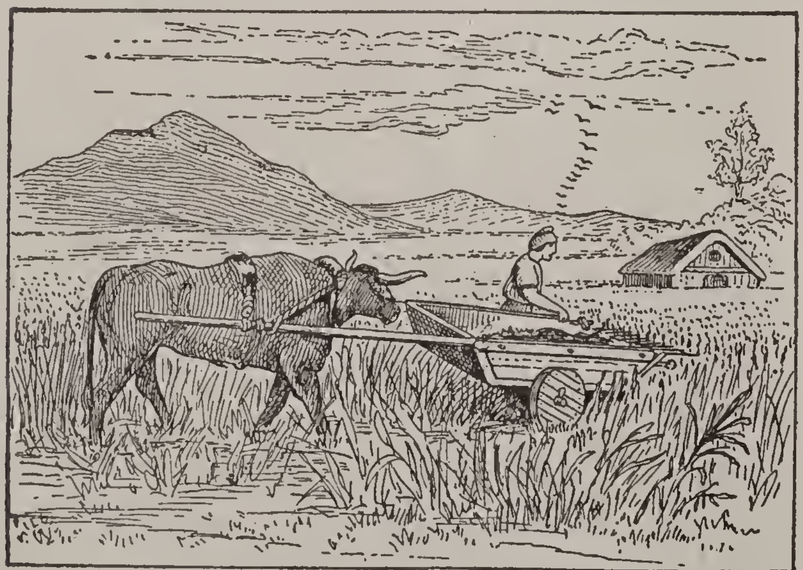

Fig. 3. THE GALLIC HEADER.

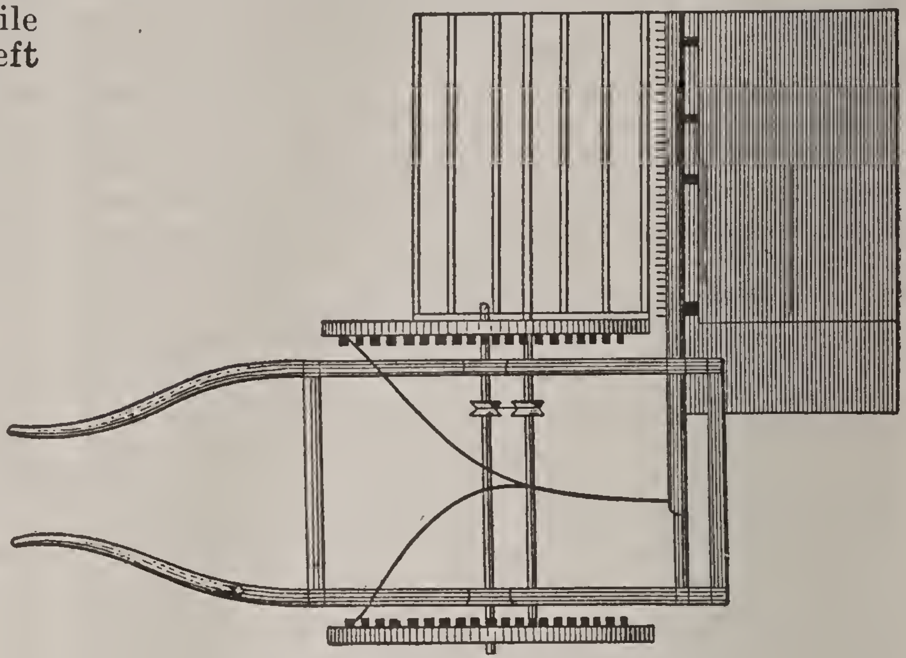

Fig. 4. OGLE'S REAPING MACHINE.

The first patent for a reaping machine in America was granted to Richard French and T. J. Hawkins, of New Jersey, in 1803. In 1812 a patent was granted to Peter Gaillard, of Pennsylvania, for a grass-cutting machine, which was the first of its kind in America or England. A more successful grass cutter was invented by Jeremiah Bailey, of Pennsylvania, in 1822. It was built on the revolving-cutter plan, with side draft and an arrangement for keeping the cutter at a uniform distance from the ground. Several other machines followed these, the most important of which was that of William Manning, of New Jersey, patented in 1831, which had a cutting device very closely resembling those of Hussey and McCormick, which afterward became so important. It also had a grain divider, the first recorded on an American machine. At this epoch American genius combined all the best features of preceding inventions, English and American, in two practical machines—that patented by Obed Hussey, of Maryland, in 1833 and that patented by C. H. McCormick, of Virginia, in 1834. These machines were very similar in principle. Hussey's was provided with a cutter of pointed blades attached to a bar, which vibrated through slots in iron fingers projecting from the front of the cutter bar. The grain fell on a platform and was raked off by a man riding on the machine. It had no reels. McCormick's had a serrated edge knife with wavy outline instead of pointed sections as in Hussey's. It was provided with a divider and reels, but no seat for the attendant, who raked off the cut grain. Both were side-draft machines. McCormick's was arranged so that it could be either drawn or pushed. These two machines furnished the basis upon which all successful modern machines have been constructed.

In 1848 Nelson Platt, an American, invented a self-acting rake, which swept over a quadrantal platform and left the grain in gavels at the side of the machine. This was the first of the sweep-rake type, although numerous devices for delivering the grain in gavels at the side of the machine had been patented. In 1851 Palmer & Williams and William H. Seymour obtained patents for sweep rakes over quadrant platform. In 1856 Owen Dorsey, of Maryland, patented a self-rake which was an improvement of Hoffhein's type, invented in 1852. McCormick introduced his self-rake in 1861, based on S. A. Lindsay's patent of 1859.

The first recorded attempt to bind grain by machinery was made by John E. Heath, of Ohio, who obtained a patent in 1850 for a twine or cord binder. Other patents rapidly followed for machines using cord, straw, and wire. The most practical of these earlier machines, although not strictly a binder, was that known as the Marsh harvester, patented in 1858, in which the cut grain was elevated to a receiving box from which it was taken and bound by two men riding on the machine. This machine contained many features of the modern binder, especially the delivery of the grain by a canvas carrier over the drive wheel as distinguished from the "low-down" type in which the binding device was attached to the self-rake. In 1864 Jacob Behel invented the knotting bill, which with slight modifications is used in almost all modern binders. In the meantime various fairly successful wire-binding machines were put on the market by different manufacturers, but in 1875 John F. Appleby, who had invented a successful twine knotter as early as 1859, made a binding apparatus, which with subsequent improvements furnished the basis for the binding apparatus of almost all modern binders, which are essentially a combination of this binding device with the Marsh type of harvester.

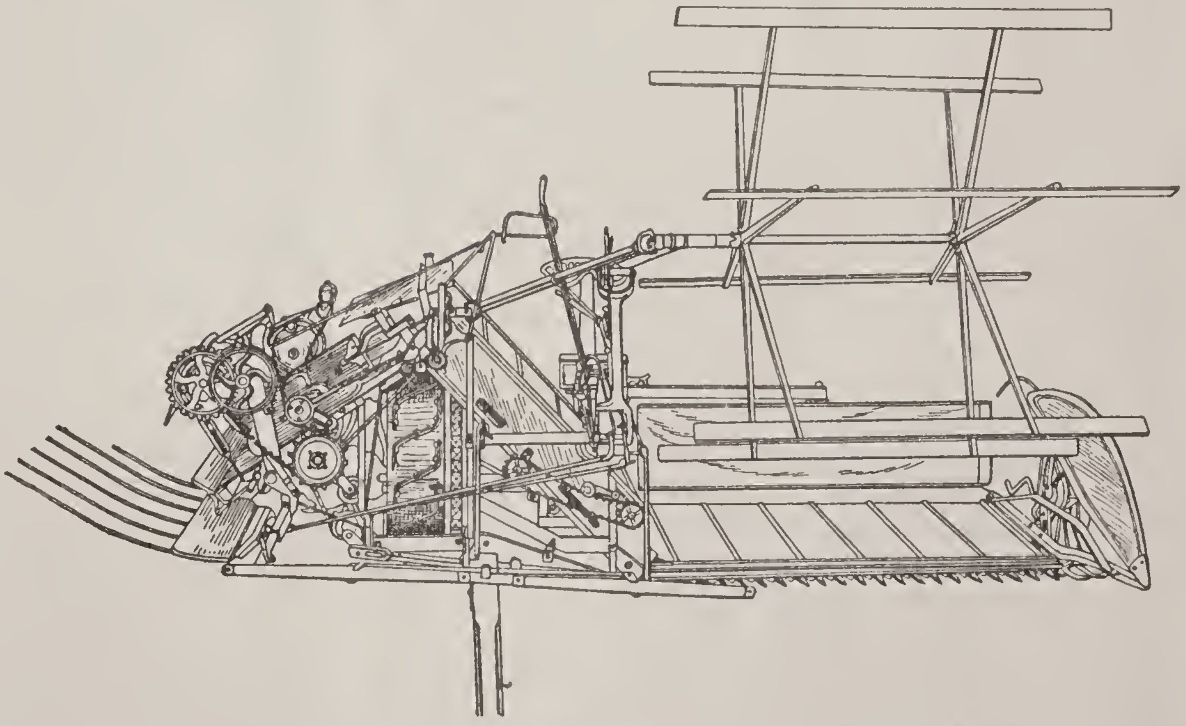

FIG. 5. A MODERN HARVESTER AND BINDER—FRONT VIEW.

The most advanced and complicated type of harvester is probably the combined header and thresher which is used to a considerable extent in some parts of the western United States and in Australia, where there is no fear of rain during the harvest. This machine heads, threshes, cleans, and sacks the grain at one operation. Machines of this kind are pushed through the grain either by a traction engine or by horses, 30 to 40 of the latter being required for each machine, which latter have a capacity of from 60 to 125 acres per day. It is stated that as early as 1850 a machine was invented and successfully tried in Devonshire, England, which stripped the grain from the straw, cleaned it, and ground it into flour at one operation. Headers are also made for use uncombined with a thresher. The cut grain is deposited by means of elevators in wagons which are drawn beside the headers. A patent for a machine of this kind was granted to Jonathan Haines in 1849.

The mower developed simultaneously with the reaper. In fact, many of the earlier machines were designed to be used either as a mower or as a reaper. A separate machine for cutting grass was patented as early as 1812 by Peter Gaillard, of Pennsylvania. Hussey's original machine was really a mower, being built on principles afterward adopted and developed in the construction of mowers. The most prominent name connected with the early development of mowers is that of W. F. Ketchum, who patented in 1847 a mower of simple design, having a single driving wheel. After the adoption of the Hussey type of cutter this machine proved a very successful mower of the rigid-bar class. The first patent for a mower of the flexible-bar type was granted to Cyrenus Wheeler in 1854. The flexible-bar idea was further developed in a machine invented by Jonathan Haines in 1855. This had two drive wheels and a cutter bar jointed to the main frame in such a manner that it could be lifted over obstructions. In 1856 Aultman & Miller patented a machine which contained practically all of the essential features of the successful modern mower, viz., two driving wheels (the best types of modern reapers have one), the flexible cutter bar, with rapidly reciprocating blades, having smooth-edge sections, which was so hinged to the main frame that it could be raised and folded over against the latter when the machine was not in use. While combined reapers and mowers are still made, separate machines for the two purposes are considered preferable.

Corn (maize) harvesters have been highly developed. The most successful types include the harvester with automatic knife guards, which is drawn between the rows, cutting two rows of corn at once; the binder, which cuts and binds the stalks into bundles; and the shocker, which cuts the corn and gathers and binds it into shocks. These machines harvest an acre of corn at a net cost of $1 to $1.50. Corn pickers which pick the ears from the standing stalks and husk them are in use to some extent in the purely corn-growing regions.

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REAR ADMIRAL. See Admiral.

REAR GUARD. Security embraces all those measures taken by a military command to protect itself from observation or surprise by the enemy. This security for the rear of a marching force is obtained by the use of a covering detachment called a rear guard. A strong rear guard is of vital importance in covering a retreat. When a commander decides to retreat, he issues the necessary order. During the retreat the outpost (q.v.) for the night usually forms the rear guard of the following day. The strength of a rear guard depends upon the nature of the country and the strength and character of the pursuing force. It cannot, like the advance guard (q.v.), count on the support of the main body. Machine guns are especially useful in the passage of defiles and in covering the crossings of rivers. Engineers and ambulance companies are usually assigned to rear guards. The troops of a rear guard are selected from those that have had previous local successes or have suffered little loss and are comparatively fresh. The proximity and the conduct of the enemy control to a large extent the formation of a rear guard. When it is not necessary to withdraw in deployed lines, the greater part of the rear guard marches on the road in column of route, taking up a formation resembling that of an advance guard (q.v.) faced to the rear. The distribution of troops is therefore similar to that of an advance guard, viz., reserve, support, rear cavalry.

The rear cavalry is that portion of the rear-guard cavalry following the support. The support, as in an advance guard, is divided into two parts; that part nearest the enemy is called the rear party and marches with a rear point. Mounted engineers usually accompany the support and may be attached to the rear party. When the cavalry is of sufficient strength and has horse artillery attached, the entire rear guard, excepting the reserve, may be composed of that arm. The reserve is composed mainly of infantry and artillery. The small rear guard of an advancing force is conducted practically the same as that of a retreating force, usually marching in rear of the trains to guard them against guerrillas or other marauders.

Since the function of a strong rear guard, covering the retreat of a beaten force, is to delay the pursuing enemy, it is usually impracticable to prescribe in orders the distance from the main body or the distances between the parts of the rear guard. As a rule, however, circumstances will require that such distances be greater than those employed in the case of the advance guard (q.v.). The enemy must not be allowed to push the rear guard too close to the retreating main body. The rear guard commander must select successive defensive positions to hold against the advancing pursuers and be prepared to sacrifice his last man and gun in fulfilling his mission, as little or no help can be expected from the retreating main body. For such delaying actions field artillery is especially fitted on account of its long range, by means of which it can delay the approaching enemy by causing him to deploy promptly. From a consideration of the mission required of a rear-guard commander it is seen that he must be allowed a wide discretion in the methods employed. Consult *Field Service Regulations of the United States Army* (1914), and Bond and McDonough, *Technique of Modern Tactics* (Menasha, Wis., 1913).

REAR-HORSE. See Mantis.

REA SILVIA. See Rhea Silvia.

REASON. See Thought; Understanding.

REASON, Age of. See Age of Reason.

REASON, Goddess of. See Goddess of Reason.

REATE. See Rieti.

RÉAUMUR, rå̇'ȱ'mụr', René Antoine Ferchault de (1683–1757). A French naturalist and physicist, born in La Rochelle, Feb. 28, 1683. He was educated in the Jesuits' College at Poitiers and at Bourges, and in 1703 he went to Paris, where he continued the study of physics and mathematics. His earliest publications were mathematical and obtained him an election to the Académie des Sciences in 1708. He then interested himself in the study of marine animals; he proved the power of regeneration in crustaceans, studied locomotion in star fishes, showed that zoöphytes were animals, studied the action of the electrical organ of torpedo and the phosphorescence of marine animals. In 1710 he began to compile a large work for the government, *Description de divers arts et métiers*. Somewhat later a series of important memoirs on the production of steel and on improvements in the manufacture of iron won him a yearly pension of 12,000 livres. He discovered the method of tinning iron, studied the production of fine porcelain, also the condition of forests, mines, auriferous rivers, and the fossil beds of France. He invented the Réaumur thermometer, in which for the first time the zero point was made to coincide with the freezing point. (See Thermometer.) Amid all these activities Réaumur was constantly carrying on his investigations in the field of natural history. The most important of all his publications are his works in this department; of these the greatest is *Mémoires pour servir à l'histoire des insectes* (6 vols., 1734–42). He left materials for a history of quadrupeds and birds afterward made use of by Brisson and Buffon.

RÉAUX, Gédéon Tallemant des. See Tallemant des Réaux Gédéon.

REBATE. See Railways.

RE'BEC (OF. *rebec*, *rebeke*, Fr. *rebec*, from Ar. *rabāb*, rebec, from *rabba*, to be master). A three-stringed instrument played with a bow. It was of Indian origin, and from Persia it was carried to Arabia, northern Africa, and, about the eighth century, by the Saracens into Spain. It was in outline shaped like the half of a pear, with a long neck, generally finished by a grotesquely carved human or animal head. Two trefoil-shaped sound holes ornamented the belly, and the instrument was fitted with a bridge and sound post. It was held against the breast or under the chin, like a violin. The rebec was the parent of the violin, and the three gut strings were tuned like the three lower violin strings, g, d^1, and a^1. The tone was loud and harsh, but powerful, which made it a favorite in mediæval orchestras. Specimens are very rare. For illustration, see Plate of MUSICAL INSTRUMENTS.

REBEC'CA. The beautiful Jewess, daughter of Isaac of York, in Scott's *Ivanhoe.*

REBECQUE, HENRI BENJAMIN CONSTANT DE. See CONSTANT DE REBECQUE, H. B.

REBEK'AH. See ISAAC.

REBEKAH'S CAMELS BIBLE. See BIBLE, CURIOUS EDITIONS OF.

REBEL'LION (Lat. *rebellio,* from *rebellis,* making war again, from *re-,* back again, anew + *bellum,* war). In its narrowest sense, open resistance to authority. In its public-law signification rebellion is the armed opposition to the government of a portion of its subjects for the purpose of securing a change in the constitution or laws or with a view to preventing the execution of the laws. Unless the authority against which the resistance is directed be lawful there is no rebellion. Thus, resistance to an officer who is acting beyond his legal powers is not an act of rebellion. Rebellion is sometimes said to differ from insurrection in that it is a more general and more perfectly organized resistance than insurrection and usually undertaken with a view to subverting the government, i.e., the difference chiefly is one of degree. This is the view taken by the United States Supreme Court. (*Prize Cases,* 2 Black.) Other authorities hold the reverse to be true. According to the latter view a rebel is one who openly refuses to obey the authority of the state, while an insurgent goes further and attacks the government with the intent of overthrowing it or replacing it by another. According to the public-law view civil war is a struggle between two parties occupying substantially the same geographical limits for the possession of the government, each claiming to be the legitimate party. Rebellion, on the other hand, in its advanced stage (or insurrection, according to the second view propounded above), is the attempt of a section of the people to overthrow the government or its authority with a view to replacing it by another of a different type, or for the purpose of constituting a separate nation with a separate sovereignty. Finally, there is the distinction between rebellion and revolution, which may be summed up as the difference between failure and success.

Every person who engages in rebellion is liable to the criminal penalties for treason established by the government against which he rebels, and he is dealt with by the ordinary civil authorities, but when the rebellion becomes so widespread as to embrace a vast majority of the inhabitants of a considerable portion of the country, and when the rebels have succeeded in establishing a government and raising an army or navy, and especially if they have won recognition as belligerents from foreign nations with the rights incident thereto, those who are captured are usually treated as belligerents in conformity with the rules of civilized warfare. While endeavoring to enforce its constitutional rights against armed rebellion, a nation has all the powers, not only of a sovereign, but also of the most favored belligerent. The Constitution of the United States authorizes Congress to provide for calling out the militia to suppress insurrections, and Congress has done so by empowering the President to call upon the militia whenever in his judgment danger from rebellion requires that step. The Supreme Court has decided that the President is the sole judge as to when the exigency shall have arisen.

REBELLION, WAR OF THE. See CIVIL WAR IN AMERICA.

REBENSTEIN, rā'ben-stīn, A. See BERNSTEIN, AARON.

REBER, rā'bẽr, FRANZ VON (1834–). A German art historian, born at Cham, Bavaria. After studying at the universities of Munich and Berlin he went to Rome, and in 1858 became privatdocent and an associate professor at the University of Munich. He was appointed professor at the Polytechnicum there in 1863 and served as director of the Royal Gallery from 1875 until his retirement in 1907. He wrote with sound scholarship on almost all phases of artistic development, but his works have been largely superseded by more recent research. His writings include: *Die Ruinen Roms und der Campagna* (2d ed., 1879); *Geschichte der Baukunst im Altertum* (1864–67); *Kunstgeschichte des Altertums* (1871); *Kunstgeschichte des Mittelalters* (1886; trans., 1887). The two last named, as translated into English by Clarke under the titles *History of Ancient Art* (New York, 1882) and *History of Mediæval Art* (ib., 1887), are widely known in the United States. With Baiersdorfer Reber edited the well-known publication *Klassischer Bilderschatz* (1888–90), for which he furnished the text, and *Klassischer Skulpturenschatz* (1896–1900).

REBER, rå'bâr', NAPOLÉON HENRI (1807–80). A French composer, born at Mühlhausen, Alsace. He studied with Reicha and Le Sueur, wrote chamber music, and set to music the new songs of the best French poets. He became professor of harmony at the Conservatory in 1851 and succeeded Halévy as professor of composition in 1862. He was inspector of the branch conservatories from 1871 and elected to Onslow's chair in the Acádemy in 1853. Among his works are a ballet, *Le diable amoureux* (1840); the comic operas, *La nuit de Noël* (1848), *Le père Gaillard* (1852), *Les papillotes de M. Benoist* (1853), and *Les dames capitaines* (1857). His works, which are written in the spirit of the German classics, include also four symphonies, one overture, and one suite for the orchestra, considerable chamber music, pieces for the pianoforte and violin, and about 30 songs, besides *Vocalises* for soprano or tenor. His *Traité d'harmonie* (1862) ranks among the best modern works on theory and has been reprinted several times. He died in Paris.

REBIKOV, rā'bē-kôf, VLADIMIR IVANOVITCH (1867–). A composer of the ultra-modern school, born at Krasnoyarsk, Siberia. He studied music in Germany under Mühler and Jaksch, founded in 1897 the Composers' Society at Odessa, and until 1902 conducted the Imperial Musical Society at Kishinev. In 1901 he settled in Moscow and after a short stay at Berlin settled definitely in Vienna, devoting himself to musical composition. Rebikov's music, apparently written solely for certain effects, is vague and formless when judged by accepted standards.

His "melomimics," short lyric pieces without words in which music and mimicry are supposed to explain or interpret one another, are scarcely to be taken seriously. His works include two operas, *The Storm* and *Elka;* three orchestral suites, *The Ballet, Dreams*, and *Suite Miniature;* three symphonic poems; many choral compositions, and soli for voice and orchestra.

REBMANN, rĕp′mȧn, JOHANNES (1820–76). A German missionary and African explorer, born at Gerlingen, Württemberg. He was sent by the British Church Missionary Society to Mombasa, East Africa, as an assistant to Krapf, with whom in 1849 he discovered the mountains Kilimanjaro and Kenia. Rebmann spent 38 years in Africa and acquired considerable knowledge of several of the native languages. He published a *Dictionary of the Kiniassa Language* (1877) and a map of East Africa (1856) in Petermann's *Mitteilungen*.

REBOLLEDO, rā′ʙō-lyā′ᴅō, BERNARDINO DE, COUNT (1597–1676). A Spanish poet, born at León. From his youth he was a soldier and fought against the Turks and in Barbary and in the Thirty Years' War. He was made Ambassador to Denmark (1647) and afterward to Sweden and lived for many years in the North. In 1663 he was appointed Minister of State, a post he held until his death. His works include: *Ocios* (1650), a poem; *Selva militar y política* (1652), a didactic poem; *La constancia victoriosa* (1655), and some epistles, epigrams, and excellent ballads. His style is prosaic, but it is simple and usually unaffected. The three-volume edition of his works (Madrid, 1778) contains a biography.

REBOUX, re-bōō′, PAUL (1877–). A French poet and novelist, known particularly for his exotic fiction. He was born in Paris and became director of the review *Les Lettres*. His verse includes: *Les matinales* (1898); *Les iris noirs* (1899); *Missel d'amitié* (1900). Among his novels are: *Josette* (1903); *La maison de danses* (1904); *Le phare* (1907); *A la manière de . . . pastiches* (1908); *La petite papacoda* (1911); *Le jeune amant* (1913).

RE′CALES′CENCE. See HEAT.

RECALL. A method of removing from office before the expiration of his term an official who has proved unsatisfactory to his constituency. Such an institution appeared in the Continental Congress and has long been employed in the Swiss canton of Schaffhausen. As a result of a quite independent political development, a provision for recalling elective officials was incorporated in the Los Angeles charter of 1903. Seattle adopted the recall in 1906, and in the succeeding five years it made its appearance in numerous municipal charters throughout the country, especially associated with the commission form of government. In the same period the recall was incorporated in several State constitutions, extending to legislative and administrative officers, and, in the case of Oregon, Arizona, and California, to judicial officers as well.

The machinery of the recall differs in detail from jurisdiction to jurisdiction. In order that a recall election may be instituted, a petition, signed by a specified proportion of the voters, must be filed with the appropriate officials, who, after satisfying themselves as to the genuineness of the signatures, order an election. There is considerable variety in the proportion of voters required for a recall petition. In St. Joseph, Fort Worth, Grand Junction, and Berkeley only 20 per cent of the voters are required. In Iowa, Kansas, Oregon, and in many cities the proportion is 25 per cent; in a few instances the proportion runs to 35 per cent or even higher. In Iowa cities the voting population, of which the recall petitioners must represent a definite proportion, is determined by the aggregate vote for all candidates for mayor in the next preceding election. In Los Angeles it is determined by the total vote for candidates for the particular office it is sought to vacate; in Fort Worth, by the entire population entitled to vote at the election.

In most instances some restriction is placed upon the employment of the recall. In Oregon no petition may be circulated against a State official unless he has held office for six months, excepting members of the Legislature and Senate, who may be recalled after five days from the opening of the legislative session following their election. After one unsuccessful recall election has been held, no further petition will be entertained unless the petitioners pay into the public treasury a sum sufficient to defray the cost of the election.

The recall has been vigorously attacked on the theoretical ground that it creates an insecurity in office that tends to deter the better sort of men from becoming candidates for office, and that, when extended to judges, it destroys the independence of the judiciary. Practical experience with the institution indicates that it is too cumbersome a device to be employed freely. The instances in which the recall has been applied to judges have been very few and discriminating. Nor in the case of elective officers has the complaint arisen that the recall has been used without good ground. Many political scientists look upon the recall as a natural complement of the tendency towards concentrating responsibility in the hands of a small number of officials, as in the commission form of government.

Bibliography. C. A. Beard, *Documents on the Initiative, Referendum, and Recall* (New York, 1912); W. B. Munro (ed.), *The Initiative, Referendum, and Recall* (ib., 1912); D. F. Wilcox, *Government by All the People* (ib., 1912); W. E. Rappard, *Initiative, Referendum, and Recall in Switzerland* (Philadelphia, 1913); Mabie and White (eds.), *Courts and Social Reform* (White Plains, N. Y., 1913); E. M. Phelps (comp.), *Selected Articles on the Recall* (2d ed., ib., 1915).

RÉCAMIER, rȧ′kȧ′myȧ′, JULIE, MADAME (1777–1849). A French leader of social and political circles, born at Lyons. In 1793 she married a wealthy but aged Parisian banker, Jacques Récamier, and his wealth enabled her to shine in society. Her salons became famous as the rendezvous of the foremost writers and thinkers of the time. For Madame de Staël she had a great and lasting regard, and in 1806, after M. Récamier was ruined, she was the guest of Madame de Staël at Coppet in Switzerland. In 1811 Napoleon ordered her to leave Paris on account of her political views, and she then resided for several years in Switzerland. In 1815, however, she returned to Paris and established herself in the Abbaye-aux-Bois, where she was the centre of a group of the brilliant men and women of the time. The only suitors for her hand towards whom she evinced any partiality were Prince August of Prussia and, later, Châteaubriand. The history of their efforts to win her in marriage is well known, but, though her husband died in 1830, she remained a widow until her death. Consult: *Souvenirs et correspondance tirés des papiers de Madame Récamier* (Paris, 1859); Madame Lenormant, *Madame Récamier* (ib., 1872; Eng. trans. of these two, Boston, 1867, 1869); Châteaubriand, *Mémoires d'outre tombe*, vols. viii–x (Paris, 1848); H. N. Williams, *Madame Récamier and her Friends* (London, 1901); E. Herriot, *Madame Récamier* (2 vols., New York, 1906).

RECANATI, rā′kȧ-nä′tē. A town in the Province of Macerata, Italy, situated on a hill between the Musone and the Potenza, 15 miles south of Ancona. It has a fourteenth-century Gothic cathedral, a statue of the poet Leopardi, a library, and a new town hall. There are manufactures of silk, and wine and olive oil are made. Pop. (commune), 1901, 15,586; 1911, 15,297.

RE′CAPIT′ULA′TION THEORY (Lat. *recapitulatio*, from *recapitulare*, to recapitulate, from *re-*, back again, anew + *capitulum*, chapter, dim. of *caput*, head), or BIOGENETIC LAW. A statement of the fact that the development of the individual is an epitome of that of the order or class to which it belongs. The basis of the law or principle is the well-grounded view or assumption now universally held by biologists that all animals have had a common ancestry, proved by the fact that all the animals whose embryological development has been carefully studied pass through stages or temporarily inherit structures or states of structures which are permanent in and characteristic of the more primitive or ancestral members of the class to which they belong. Cf. PALINGENESIS. See BIOGENESIS.

RECAP′TION. In law, the right which a person has to retake without legal process goods and chattels of which he has been illegally deprived by another. The right is one of the surviving forms of self-help (q.v.), or of direct remedy for a wrong suffered. In general one may pursue a thief and retake by force an article which the latter has wrongfully seized, but the right extends even to the case where a person has under a claim of right taken a chattel out of another's possession and detains it on his own premises, or where one has, however innocently, come into possession of goods and chattels of another, or where a person's goods have by accident fallen upon the land of another. But the right is in every case, except that of a forcible taking out of possession, restricted to a peaceful recaption and will not justify an assault on the person of the wrongful possessor or a breaking into the house in which the property is detained. See REPLEVIN; TRESPASS.

RECAP′TURE. In international law, a term having reference to the retaking by an armed vessel of one belligerent or its ally of a prize captured by a vessel of the other belligerent from a subject or citizen of the first. To adjust the conflicting rights of original owner and recaptor, a legal fiction, the *jus postliminii* of the Romans, was devised. According to this rule the title to property recaptured from an enemy in war was revested in the original owner upon payment of salvage to the recaptors. The rights of persons recaptured from the enemy were restored upon the payment of a certain sum. The amount of salvage is determined by a prize court in accordance with the law of the state to which the recaptor belongs. The law of the United States recognizes the principle of reciprocity as regards the amount paid foreign vessels recapturing American vessels from the enemy.

RECEIPT′ (OF. *recete*, *recepte*, Fr. *recette*, from ML. *recepta*, receipt, fem. sing. of Lat. *receptus*, p.p. of *recipere*, to receive, from *re-*, back again, anew + *capere*, to take). The transaction by which one takes into his possession or custody property delivered to him by another. It is also the technical name for an acknowledgment of the receipt of property executed in writing by one who has taken the property into his possession or custody.

A written receipt is evidence only of the fact that money or property was received by the persons executing it. It does not differ in legal effect from any other evidence of the fact of receipt, although it may be more conclusive than mere verbal testimony. A written receipt may accordingly be explained or contradicted by other evidence and will have no effect if fraudulently procured or if untrue in fact. It is owing to its character as evidence that a receipt is to be distinguished from a release (q.v.), which operates as a discharge or extinguishment of a legal obligation. In a few States, however, notably New York, it has been held that a simple receipt, when given with intent to extinguish a debt, would be deemed a gift of the debt, although given without consideration, and would thus extinguish the debt. A receipt is not subject to the parol-evidence rule. (See EVIDENCE.) It may, however, be incorporated in a contract, as in the case of bills of lading (see BILL OF LADING) or warehouse receipts (see WAREHOUSE RECEIPT), which may and usually do contain both a receipt for the goods delivered to the carrier or warehouseman and a contract fixing the terms of the bailment. So far as the bill of lading or warehouse receipt is a contract it is subject to the parol-evidence rule and cannot be contradicted by oral testimony, but its effect as a receipt may be explained or contradicted by such testimony. This rule, however, varies when the bill of lading or warehouse receipt has been indorsed to an innocent holder for value. The carrier or warehouseman will then be estopped to deny the receipt as written. It seems probable that one delivering property or paying money in performance of a legal obligation may not lawfully demand a receipt as a condition of the performance of his obligation. The question, however, is not settled. Receipts are required by statute to be given in some cases. Consult the authorities referred to under CONTRACT.

RECEIV′ER (OF. *recevour*, *receveur*, Fr. *receveur*, from *recevoir*, to receive, from Lat. *recipere*, to receive). An indifferent person between the parties to a litigation appointed by a court of equity to take charge of and preserve property or money involved in the litigation and to collect the rents, issues, and profits thereof pending a final disposition of the controversy. A receiver is an officer of the court. Property placed in his care is regarded as being *in custodia legis*, to be administered by him under direction of the court; and it is thus not subject to other judicial process, and jurisdiction cannot be acquired over it by other courts having concurrent jurisdiction over the subject of the suit. See JURISDICTION.

The appointment of a receiver is one of the important forms of the preventive remedy exercised by courts of equity and is of great benefit when there is danger that property which is the subject of judicial controversy may be wasted, destroyed, or removed from the jurisdiction of the court pending the litigation. By the appointment of a receiver the court insures the preservation and final appropriation of the property as its decree may direct. As the mere legal custody of the receiver is sufficient for this purpose, he acquires no title to the property. He is a ministerial officer, and in general his powers are those only which are granted by the order or decree appointing him. If acting within his powers he has some discretion and may exercise his judgment as to the manner of their exercise. In that case he is not liable for errors of judgment, but if negligent or acting outside his authority, he is personally liable for his misconduct. When in doubt as to his powers he may apply to the court for authority and direction. A creditor or other interested party may also apply to the court for modification of the order appointing the receiver or for supplementary orders to govern his conduct or in a proper case for an order removing him. In general a receiver has no authority to sue unless directed by the court to bring an action; and action may not be brought against him without the express authority of the court. The powers and duties of receivers are now generally regulated by statute or by rules of court.

The following are the more important cases in which a receiver will be appointed: (1) When there is no present legal owner of property involved in the proceeding, although the parties to the litigation are equitably entitled to it, as in case of an intestate's personal property. The same relief is now generally obtained by the appointment of a temporary administrator. (2) When the legal owner is incompetent to manage his property, as in case of infancy or lunacy, and there is no guardian or commission having legal authority to protect the property. In most jurisdictions guardians of infants and committees of lunatics have statutory authority sufficient to render the appointment of a receiver in such cases unnecessary. (3) When the litigants are equally entitled to the custody of the property and justice requires that neither one should be permitted to control it to the exclusion of the other and circumstances do not permit their joint control, as in the case of the dissolution and winding up of a partnership or the partition of real estate. (4) When the title or possession of property is held by one in a fiduciary capacity or relation who is not properly performing his trust, as a mortgagor in an action to foreclose a mortgage, a trustee in an action for an accounting, or one having property claimed in a judgment creditor's action. (5) When the appointment of a receiver is necessary to assist in carrying out the decree of the court, as where in judgment creditors' actions, in order to satisfy the judgment, a receiver must sell property which had been conveyed in fraud of creditors.

The appointment of a receiver is always a matter within the discretion of the court and cannot be claimed as an absolute right.

The expenses of a receivership, including the receiver's own fees, are a first lien on the property held by him as receiver. In some cases the court will authorize a receiver to raise money for the purpose of preserving the property and continuing it in business by issuing receiver's certificates, which are made a first lien on the property. This will ordinarily be done only when some public interest will be subserved by the continuance of the business, as in the case of railroads or other public-service companies. Such certificates, when issued, are nonnegotiable securities, payable out of the fund in the receiver's hands. They create no personal liability, and their validity depends upon their compliance with the order authorizing their issue. If issued below par the holder can recover only the amount actually received for them by the receiver unless he was authorized to issue them at a discount. One who indorses a receiver's certificate does not become liable as an indorser of negotiable papers, but as a mere assignor only. The holders in general will not be allowed to sue upon them, but may in a proper case obtain an order of the court directing their payment. Consult: J. W. Smith, *The Law of Receiverships* (Chicago, 1897); W. A. Alderson, *Practical Treatise on the Law of Receivers* (New York, 1905); J. L. High, *Treatise on the Law of Receivers* (4th ed., Chicago, 1910); W. W. Kerr, *Law and Practice as to Receivers* (6th ed., Toronto, 1912). See CHANCERY; EQUITY.

RECEIVING SHIP. In the United States navy vessels are stationed at each navy yard for the enlistment of men and to furnish quarters for them from the time of their enlistment until drafted into seagoing ships. While on board these receiving ships the men are drilled and trained as far as the time of their retention and other circumstances will permit. On some receiving ships there are schools for yeomen (ship's clerks), petty officers, etc.

RECEIVING STOLEN GOODS. A criminal offense which consists in taking possession or control of stolen goods with a guilty knowledge of the fact and with the fraudulent or dishonest intention of continuing to deprive the rightful owner of the possession of his property. By the early common law in England the offense was merely a misdemeanor, but by statute it has been made a felony. In the majority of the United States it is a distinct criminal offense, classed as a felony, and is punishable with about the same severity as larceny. A number of States classify the offense under the general head of larceny. Consult the authorities referred to under CRIMINAL LAW. See STOLEN GOODS.

RECENT PERIOD (Lat. *recens*, fresh, new). In geology, the name given to the epoch that has elapsed since the Pleistocene and the beginning of history. Many geologists now include it under the Pleistocene period (q.v.).

RECERCELÉE. See CERCELÉE.

RECESSIVE CHARACTERS. See HEREDITY.

RECHABITES, rĕk′ȧ-bīts (Heb. *Rĕkābīm*, from *Rĕkāb*, Rechab). A Kenite clan (see KENITES) who retained their nomadic habits and mode of life in the midst of agricultural Palestine. The notices of them in the Old Testament are too few to make it possible to trace with any definiteness either their origin or history. According to 2 Kings x. 15–28, Jehonadab, the son of Rechab, displayed great zeal for the Yahwe worship in the days of Jehu. The Rechabites are said to have taken refuge in Jerusalem when Nebuchadnezzar invaded the land (Jer. xxxv). In Neh. iii. 14 Malchiah, the son of Rechab, is mentioned as one of those who assisted in rebuilding the walls of Jerusalem. The Rechabites seem to have maintained the old nomadic customs and rites and opposed the higher forms of culture. They lived in tents, built no houses, sowed no seed, planted no vineyard, and drank no wine, obeying the injunction of Jehonadab, the son of Rechab. The same conservative tendency appears in various incidents in the Old Testament. For example, in the narrative of Cain and Abel a distinct preference is shown for Abel, the pastoral nomad, over Cain, the agriculturist. And again in Gen. ix. 20–27 a point of view similar to the Rechabite seems to be represented in the story of Noah and the vineyard which he planted. In 1 Chron. ii. 55 certain families of scribes dwelling at Jabez, such as the Tirathites, the Shimeathites, and the Suchathites, are said to be Kenites "that came of Hemath, the father of the house of Rechab." The promise that there would always be a man of the Rechabites to stand before Yahwe (Jer. xxxv. 10) was interpreted by R. Jonathan to mean that they were to become scribes and members of the Sanhedrin. But the phrase seems to refer to some priestly function; and it is not improbable that the abandonment of the nomadic life and elevation into some position in the lower clerus led to the justificative story in Jer. xxxv. Consult: W. H. Bennett, *Commentary on Jeremiah* (London, 1895); Karl Budde, *The Religion of Israel to the Exile* (New York, 1899); Nathaniel Schmidt, "Book of Jeremiah," in *Encyclopædia Biblica* (ib., 1901); Barton and Eisenstein, "Rechabites," in *The Jewish Encyclopædia* (ib., 1905); W. R. Smith, *Lectures on the Religion of the Semites* (new ed., ib., 1907).

RECHBERG UND ROTHENLÖWEN, rĕK′-bĕrK ụnt rō′ten-lẽ′ven, JOHANN BERNHARD, COUNT VON (1806–99). An Austrian statesman. He studied at Strassburg and Munich and, entering the Austrian diplomatic service as attaché of the Embassy at Berlin in 1828, became Secretary of Legation at London in 1830, and later held appointments at Darmstadt (1833–36), Brussels (1836–41), Stockholm (1841–43), and Rio de Janeiro (1843–47). Returning to Austria he aided Prince Metternich during the revolution of 1848, became Austrian *internunzius* at Constantinople in 1851, and in 1853–55 was associated with Radetsky in the government of Lombardo-Venetia. In 1855 he went to Frankfort as Austrian representative and as President of the Federal Diet. Rechberg was Minister-President in 1859–60, and Minister of Foreign Affairs in 1859–64. For history of the period of his ministry, see sections on *History* under GERMANY and AUSTRIA-HUNGARY.

RECID′IVISTS (from Lat. *recidivus*, falling back, from *recidere*, to fall back, from *re-*, back again, anew + *cadere*, to fall). The term applied in penology to those who have been more than once sentenced for crime, i.e., old offenders. It is a striking commentary on the effectiveness of penal systems that according to official returns from the leading nations of the world the recidivists are 40 per cent or more of the prison population. Z. R. Brockway estimated the percentage in the prisons of New York at not less than 60; while W. D. Morrison, of England, estimates that the percentage is not less than 70. It is even possible to find an individual who has been arrested 1000 times, while in the large cities, even of America, individuals who have served more than 100 short sentences are by no means unknown. H. M. Boies estimates that "at least two-thirds of the crimes in America are committed by recidivists and that the yearly cost of their incarceration could be estimated at $400,000,000."

In his intensive study of the *English Convict* Dr. Goring shows that recidivism is especially common among defectives, among persons not used to regular labor before their first conviction (unemployables), and among those of a demonstrably neglected childhood. To meet the problem of recidivism the traditional method is increasing severity of punishment for second and later offenses. The modern tendency, still far from paramount, is to strike at the roots of recidivism through provision of satisfactory employment for discharged convicts, through industrial training in penal institutions, permanent segregation of defectives, systematic care of orphaned and deserted children, etc. See CRIMINOLOGY; PENOLOGY; and the references there given.

RECIFE, rå-sē′få. The capital of the State of Pernambuco, Brazil. See PERNAMBUCO.

RECIP′ROCAL (from Lat. *reciprocus*, alternating, reciprocal, probably from **recus*, backward, from *re-*, back again, anew + *procus*, forward, from *pro*, before). One number is said to be the reciprocal of another if their product is unity. For example, $a \cdot \frac{1}{a} = 1$, hence a and $\frac{1}{a}$ are reciprocals. Also $\frac{a}{b} \cdot \frac{b}{a} = 1$, hence $\frac{a}{b}$ and $\frac{b}{a}$ are reciprocals. The term is variously used in geometry. See DUALITY; POLE AND POLAR.

Reciprocal Equations. An equation is said to be reciprocal when its roots admit of being arranged in pairs of the form $r, \frac{1}{r}$. In the case of a reciprocal equation of even degree the coefficients of the terms equidistant from the extremes are equal and have the same sign. In the case of those of odd degree the coefficients of the terms equidistant from the extremes have the same absolute value and have either the same or opposite signs. One root of a reciprocal equation of odd degree must therefore be $+1$ or -1. Dividing by $x \pm 1$, such an equation reduces to one of even degree.

RECIPROCITY, rĕs′ĭ-prŏs′ĭ-tĭ (from Lat. *reciprocus*, alternating, reciprocal). A tariff policy under which two or more sets of tariffs contemporaneously exist; a high schedule of duties for countries which have entered into no special agreement with the enacting country, and one or more lower schedules for such others as may be willing to offer correspondingly reduced schedules in return. The reciprocity system sprang up as a means of relief from the old navigation laws, and was then gradually extended, not only to tariff duties, but to general matters of commercial privilege as well. The organization of the German Zollverein (q.v.) gave a strong stimulus to the idea of mutual freedom of exchange, and the movement thus begun gradually developed into a semi-free-trade era, which lasted until about 1870. Great Britain repealed the Corn Laws during the years succeeding 1846, and in 1860 negotiated a treaty with France containing liberal commercial concessions. This was followed by some 27 other reciprocal arrangements between the leading European states, which resulted in great freedom of exchange and largely stimulated trade. A similar movement in the United States culminated in the liberal tariffs of 1846 and 1857. Very generous treaties of reciprocity were negotiated by the United States with the German Zollverein and Mexico, respectively (1844 and 1859), but both failed of ratification.

The first real experiment in reciprocity made by the United States is found in the Canadian Treaty of 1854. Between the years 1846 and 1855 it was several times sought to secure the passage of concurrent legislation by the making of mutual tariff concessions by the two countries. These efforts failed, partly for political reasons, but largely because of difficulties connected with the allied questions of fisheries and the navigation of the St. Lawrence. Finally the reciprocity treaty was negotiated, and passed by the Senate (receiving the President's signature Aug. 5, 1854), owing largely to personal work in Washington by Lord Elgin, then Governor-General of Canada. As ultimately adopted the Canadian treaty covered the navigation of the St. Lawrence, the fishery question, and provided for mutual free trade between Canada and the United States in a long list of articles, the growth or the products of the two countries. This list included most foodstuffs, a wide variety of raw materials, and coal, wood, rough lumber, etc. The immediate effect of the treaty was apparently to stimulate trade. Its popularity, however, received a severe blow in the crisis of 1857, which reduced both the imports and exports of the United States in the Canadian trade, but the volume of business almost immediately revived. Various complaints, however, arose against continuing under the treaty, a principal objection being that the Canadians were not keeping good faith. Commissioners of the United States examining into the advisability of the reciprocity relations made diametrically opposite reports. Between 1860 and 1865 the question of abrogating the treaty was much discussed in Congress. The strained relations with England on account of the *Alabama* claims brought the question to the front and finally, in 1865, a Senate resolution terminating the agreement was concurred in by the House, being signed by the President on Jan. 18, 1865. The relations of the United States with Canada under the treaty closed March 17 of the same year. Since that time numerous efforts have been made to renew the reciprocity trade relations between the two countries—in 1866 by a Canadian delegation, followed by other Canadian attempts in 1869 by Sir John Rose and in 1873 by George Brown and Sir Edward Thornton—all with no result. In 1890–92 Hon. (now Sir) Robert Bond, of Newfoundland, was a delegate to Washington in behalf of a reciprocity treaty with that colony and succeeded in negotiating the Bond-Blaine convention, but it was never ratified. So also various bills and resolutions for reciprocity with Canada were tabled or voted down in Congress from time to time. Attempted amendments to tariff bills met the same fate. A later development in the struggle for better trade relations with Canada was the appointment of the Anglo-American Joint High Commission, on which the United States, Britain, Canada, and Newfoundland were represented, which was to settle practically all points in dispute between the British Empire and the United States, including reciprocity. Its work was without practical result. During the years 1902–03 an unusually strong agitation for reciprocity with Canada sprang up in the Northwest and in New England. This was due to the growing need for cheap lumber, ores, and coal along the northern boundary of the United States. The subject of reciprocity with Canada came into prominence with the passage of the Payne-Aldrich Tariff Law in 1909. Canadian and American commissioners worked out a project to be submitted to their respective national legislatures, providing for mutual free trade in many of the products of the two countries, such as foodstuffs, and reduced rates on manufactures. The project, though very unpopular in parts of the country, especially the Middle West, carried in Congress in 1911. The opposition in Canada was stronger, and after an unsuccessful appeal to the country the Liberal party went out of power and the reciprocity project was abandoned.

An important experiment in reciprocity was undertaken in the Treaty of 1875 between the United States and Hawaii. The plan of annexing the Hawaiian Islands had been brought forward several times before 1875, and one or two abortive efforts to secure a reciprocity treaty with them had been made. What finally forced the question upon the attention of Congress was the growing power of England in the Pacific and the development of British trade with the islands, added to the fact that American citizens had acquired large holdings of land in Hawaii and were desirous of receiving discriminating trade advantages. The signal for action was given by internal disturbances in the islands in 1874 and the accession of a king strongly favorable to American interests. A treaty was finally negotiated and was signed by the President on April 17, 1875, going into effect June 30. A bill to make the modifications of duties rendered necessary by the treaty was brought up and passed in the House of Representatives. By this treaty the United States admitted, free of duty, sugar and a few tropical products, including rice, while Hawaii relieved of duty various kinds of agricultural and meat products as well as machinery and other manufactures. At the time the treaty was adopted United States imports from Hawaii amounted to about $1,300,000 annually, exports being a little over $600,000. No reduction in the price of sugar resulting, there naturally occurred a great increase in the price of sugar lands in Hawaii and a great growth in exports of sugar to the United States. This meant, of course, a corresponding loss of duties to the government without any compensating growth of exports to the islands. It was estimated that the duties lost to the United States during the life of the treaty ranged from $2,000,000 to $12,000,000 a year. In 1883 the question of renewing the treaty (first concluded for seven years) came up in Congress and strong opposition to it was shown; but a new agreement was finally ratified and put into effect (Dec. 7, 1887). The growth of hostile feeling displayed during this reciprocity struggle had, however, alarmed the sugar interests, who now began to fear the ultimate abrogation of their reciprocity privilege. This fear led to a vigorous annexation movement in the islands, resulting eventually in the annexation of the islands in 1898.

During the decade 1880–90 reciprocity first began to be advocated in the United States as a definite tariff policy. The revision of the tariff by the Republicans in 1883 was unsatisfactory to the manufacturers, who were beginning to build up an export trade and who wanted larger foreign markets. In 1883 a treaty was negotiated with Mexico, and in 1884 one with Spain for Cuba and Porto Rico and another with Santo Domingo were arranged, but they were all either killed or withdrawn by President Cleveland. In 1884 President Arthur, under authority from Congress, sent a commission to visit the South American countries and discuss the question of reciprocity with their governments. On its return a report was made by the commission in which tariff reductions on wool and sugar were laid down as a necessary basis for reciprocity with South America, and practical failure in negotiations was reported as a result of the commission's lack of power to hold out promises of such concessions. About this time President Cleveland took office (1885) and sought to secure general tariff revision in place of further efforts to get reciprocity treaties. A Republican majority, however, appeared in the Congress which met in 1889, and that party concluded to act upon the recommendation made by the South American commission that a Pan-American Congress be summoned to discuss trade relations. Such a congress met in 1889 at Washington under the title of the International American Conference. This body favored reciprocity, but indicated that tariff treaties must be based upon real reductions of duty on important articles. Many delegates expressed great doubt as to the intentions of the United States in this respect, and the general result of the conference was rather discouraging.

A considerable surplus had been accumulated in the national treasury during the first Cleveland administration, and it was desired by the Republicans on coming into office in 1889 to reduce income without lowering the tariff in general. This was done by the McKinley Act (1890), which admitted raw sugar free of duty and offered a bounty to domestic sugar growers. At the same time it was sought to appease the exporters (who wanted large markets) by using the reduction of sugar duties as a means of forcing corresponding reductions in foreign tariffs. This attempt was made in Section 3 of the McKinley Act, known as the reciprocity section, in which the President was ordered to impose specified duties upon raw sugar, molasses, coffee, tea, and hides, otherwise to be admitted free, unless the countries of origin should grant compensating tariff concessions. The principal article included in the reciprocity section was, of course, sugar; and this was admirably adapted for use as a basis for tariff bargaining, because of the sugar-bounty system of Europe. The bounty system had resulted in tremendous overproduction of sugar and had thus led to a great desire to find outside free markets for it. In the debate on the McKinley reciprocity section the meaning of the policy was explained with greater fullness than ever before. It was shown (1) that the products admitted to the United States must not compete with those produced there; (2) that the countries traded with must be such as would take the surplus of manufactures and farm produce; and (3) that the volume of trade gained by the United States under any agreement must be equivalent to that granted to the foreign country. The McKinley Act was adjudged constitutional by the Supreme Court (Fields *v.* Clark and Boyd *v.* U. S.), and Mr. John W. Foster, representing the State Department, negotiated treaties under it with Brazil, Spain for Cuba and Porto Rico, and England for Jamaica, Trinidad, Barbados, Guiana, and the Leeward and Windward islands. Treaties were also signed with Santo Domingo, Guatemala, Salvador, Costa Rica, Honduras, and Nicaragua. These treaties closely resembled one another and were designed to carry out the idea of South American reciprocity. They all included reductions of duty on live animals, some grains, corn, meat products, bridge-building materials, cottonseed and its products, cars, wagons, etc., railway material, timber, and iron for shipbuilding, and engines. Colombia, Haiti, and Venezuela declined to make tariff treaties; and President Harrison, therefore, enforced against them the retaliatory duties provided in the McKinley Act. Treaties of a rather different sort were negotiated with Germany and Austria-Hungary, by which were secured some reductions on certain cereals, meat products, flour, etc., and on sundry manufactures of cotton, wood, chemicals, and machinery. These were the so-called beet-sugar treaties. Little effect could be seen as a consequence of the reciprocity treaties, but it should be noted that during the life of these agreements trade conditions all over the world were much disturbed, so that the period was not a good one for observing their working.

The accession of President Cleveland to office for the second time (1893) was the signal for an effort to reduce the tariff. A bill introduced by William L. Wilson for this purpose retained raw sugar on the free list as well as coffee, tea, and hides, and reduced the bounty to domestic growers. In the Senate, however, the tariff on raw sugar was restored. It had not been intended by Mr. Wilson to interfere with the existing reciprocity treaties, although he did not intend to repeal the section granting power to impose retaliatory duties. The reimposition of the sugar tariff, however, ipso facto abrogated the treaties, and protests were filed by the representatives of Germany and Austria, while complaints were made by Brazil, Guatemala, Nicaragua, Costa Rica, and Santo Domingo. Trade, however, does not appear to have been materially affected by the abrogation of the reciprocity treaties, save in one or two unimportant cases. In some instances an improvement in trade followed. One of the first acts of the Republicans, as they gradually regained power after the passage of the Wilson Bill, was to announce their allegiance to reciprocity as a policy. A crop of bills and resolution on the subject came up in the first session of the Fifty-fourth Congress and were referred to the House Committee on Ways and Means.

The Republican victory of 1896 was interpreted as a verdict in favor of higher tariff duties and of reciprocity treaties. A bill providing for both had been drafted, and was early introduced, by Mr. Dingley. In this bill as first presented, reciprocity like that of the McKinley Act was contemplated. The original draft offered moderate reductions of duty upon various commodities, but while the bill was under debate an amendment was offered authorizing the President to negotiate reciprocity treaties which should later be ratified by the Senate. As finally passed the Act thus authorized the Executive to conclude treaties based upon a few unimportant commodities and to negotiate such other reciprocity treaties as he might deem appropriate for submission to the Senate. President McKinley, under this Act, appointed Hon. John A. Kasson special commissioner for the negotiation of reciprocity treaties. Treaties were negotiated and proclaimed with France, Portugal, Germany, and Italy. Later an arrangement with Switzerland was executed. No agreements with South American countries were entered into. The treaties with the European countries mentioned secured favorable treatment for a few agricultural products, oils, and some machinery. These reciprocity treaties were the only ones in operation in 1915. Mr. Kasson, however, negotiated treaties with various countries under the clauses of the Dingley Act authorizing the President to secure such agreements as he might deem best for submission to the Senate. These Kasson treaties included treaties with France, Great Britain on behalf of Barbados, British Guiana, Turks and Caicos islands, Jamaica, and Bermuda, Denmark for St. Croix, and with Ecuador, Nicaragua, and Santo Domingo. These had nearly all been sent to the Senate by the end of 1899. They were coldly received and referred to the Foreign Relations Committee. The treaties with South American countries were chiefly concerned from the side of the United States with reductions on cane sugar, tropical fruits, wool, and a few other products; that with France made some concessions on knit goods, bric-a-brac, cheap jewelry, cutlery, and similar small articles. None of them was seriously discussed except that with France, and even in that case so loud a protest was raised by manufacturers who conceived their interests to be attacked that the treaty was pigeonholed. It was, however, very generally conceded that the terms of this agreement were unexceptionable. A general reciprocity discussion began in the newspapers, and protectionists displayed a strong disposition to repudiate the whole reciprocity policy. It was more and more felt that danger inhered in the discussion of such treaties because of the probability that they would make a breach in the protection system which might lead to too general tariff revision. This opinion was distinctly voiced in the so-called reciprocity convention of manufacturers which met in Washington in October, 1901. President McKinley, however, seemed inclined to recede from his advanced protectionist position, and in a noteworthy speech at the Buffalo Exposition, just prior to his assassination, in September, 1901, had taken strong ground for reciprocity.

No treaty with Cuba had been negotiated by Mr. Kasson. This was due to the fact that the war and subsequent negotiations with Spain lasted during the time that his reciprocity negotiations with the various countries were in progress. After the United States had assumed control of Cuba, it imposed upon the constitutional convention of the Cubans the so-called Platt amendment, which was passed, after much opposition, partly on the strength of an alleged promise made by President McKinley to a delegation of Cubans that, should the amendment be accepted, he would secure a large tariff reduction for Cuban sugar exported to the United States. President Roosevelt attempted to fulfill this supposed promise by urging Cuban reciprocity upon Congress at the session 1901–02. A bill providing for a mutual 20 per cent reduction of duties on Cuban and American products was introduced in the House of Representatives, but met with strong opposition from those representing beet-sugar interests, which had sprung into prominence subsequent to 1890. These men charged that the advocates of reciprocity with Cuba were playing into the hands of the refining combination, which, it was said, had bought largely of Cuban lands and was seeking to secure cheap raw material through reciprocity. As a compromise it was proposed to grant the desired reductions, provided that the protection accorded under the Dingley Act to the process of refining (sugar differential) should be revoked. Such an amendment was incorporated into the reciprocity bill and it was passed by the House. The Senate, however, objected to the amendment and the bill was killed in committee. The autumn elections (1902) strengthened the administration. During the recess a reciprocity treaty was negotiated with Cuba and placed before the Senate at the session 1902–03. Although nothing was then done, a special session of the Senate in the spring of 1903 passed the Cuban treaty. In its original form it secured important reductions on American agricultural and manufactured products exported to Cuba in return for the concession of 20 per cent on Cuban imports to the United States, but the beet-sugar interests contrived to have it amended by a clause providing that no reductions should be granted to any but Cuban sugar during the life of the treaty. This stipulation necessarily implied the destruction of all prospect of passing the other treaties negotiated by Mr. Kasson with South American countries, inasmuch as these were largely based on sugar. Meantime Secretary Hay had negotiated (October–November, 1902) a reciprocity treaty with Newfoundland whereby certain American products were to be admitted to that colony in exchange for bait privileges for American fishing vessels in Newfoundland ports. This treaty was pigeonholed during the session 1902–03, owing to the influence of New England fishing interests.

At the beginning of the European War in 1914 reciprocity in Europe had assumed a form somewhat different from that which has been developed in the United States. That is primarily due to the interpretation put upon what is known as the most favored nation clause in international agreements, an interpretation differing from the meaning assigned to that clause in American diplomacy. According to European usage treaties incorporating the most favored nation clause assure to the signatory countries treatment as favorable as that granted to any other nation. Tariff concessions made to others become at once common to all nations having most favored relations with the country making such concessions. On the other hand, America's statesmen have adhered consistently to the view that trade concessions offered by it to some other country need not become common to a third country unless that third country grants concessions similar to those of the second country. It has been noted that under the European view of the most favored nation clause the reciprocity treaties adopted subsequent to 1860 inaugurated an era of very free trade. This was terminated shortly after 1870, owing partly to the desire to increase national customs revenues and partly to the hostilities engendered by war and political struggles. Elaborate tariffs were adopted by most European countries between 1870 and 1885. These gradually developed into two principal systems—that of general or conventional tariffs and that of maximum and minimum tariffs. The former is the plan adopted by Germany, Austria, Switzerland, and Italy, while the latter is pursued by France, Russia, Spain, Norway, Greece, and Brazil. Under the general or conventional tariff system a higher schedule is applied to those countries which have entered into no special commercial arrangement, while another or conventional tariff is granted to those which receive favored-nation treatment. Under the maximum and minimum system minimum rates are given to most-favored nations, and the home produce is thus assured fixed protection. Maximum rates, or such others on such articles as the Executive may see fit, are enforced against nations not receiving favored-nation treatment, and the Executive is allowed to bargain with these other countries for mutual tariff concessions. The latter system is of course more flexible than the general or conventional tariff. As against these methods, which might be regarded as general reciprocity, American reciprocity must be placed in the light of a series of special bargains based on no systematic plan. Reciprocity in Europe to-day is represented by the network of commercial treaties existing under these two systems. These have become exceedingly complex and interdependent. Whereas the older notion of reciprocity seemed to be based on mutual concession, the essential idea of the policy to-day seems to be that of retaliation. A movement for higher and higher retaliatory duties seems to be growing very general in Europe, while the introduction of such a system is vigorously urged in England, the classic country of free trade. This is shown by Mr. Chamberlain's proposal in the early summer of 1903 for an Imperial customs tariff, or reciprocity, union between the colonies and the mother country, which would simply mean lower colonial tariffs to English exports, in exchange for retaliatory English tariffs against foreign products competing with those of the colonies. The difficulty, of course, lies in the danger of making food dearer in Europe. It is to be observed that so soon as reciprocity becomes general in scope it is indistinguishable on the one hand from the idea of tariff revision and reduction and on the other from that of tariff retaliation. When not general in scope it implies special arrangements carrying benefits usually to special classes in the community at the expense of other classes.

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RECITATIVE, rĕs′ĭ-tȧ-tēv′ (It. *recitativo*, from It., Lat. *recitare*, to recite). A species of vocal composition in the older operas and oratorios which differs from an air in having no definite rhythmical arrangement and no decided or strictly constructed melody, but approaches, in tonal succession and rhythm, to the declamatory accents of language; it is, in fact, as near an approach as possible to speech delivered in musical sounds. When any part of a recitative is to be performed in strict time, this is indicated by the words *rec. a tempo*. When a recitative is accompanied merely by a few simple chords of an instrument it is called *recitativo secco* or *parlante*, declaimed recitative. When the voice is accompanied by a considerable portion of the instruments of the orchestra, either in sustained chords or florid passages, it is termed *recitativo accompagnato, stromentato*, or *obligato*. Wagner's recitative is invariably supported by a rich and elaborate orchestral part, a method adopted by all subsequent operatic composers. See Leitmotiv; Melos.

RECKE, rĕk′e, Charlotte Elisabeth Constantia von der, usually known as Elisa (1756–1833). A German author, born on the estate Schönburg, in Courland, a daughter of Count Friedrich von Medem. In 1771 she married Baron von der Recke, from whom she was divorced six years later. Her unhappy married life and the untimely death of her daughter produced in her an inclination to mysticism and spiritualism, which was increased through acquaintance with Cagliostro, whom she met at the court of her sister Dorothea, Duchess of Courland. In 1784, while she was living at Karlsbad, she was made aware of Cagliostro's character and was thereupon prompted to write *Nachricht von des berüchtigten Cagliostro Aufenthalt in Mita* (1787), which aroused interest throughout Europe. But her poetic works are mediocre. Catharine II of Russia gave her a valuable country seat. Besides the book mentioned above she wrote *Geistliche Lieder einer vornehmen kurländischen Dame* (1780–1815) and *Gebete und religiöse Betrachtungen* (1826). Consult Eberhard, *Blicke in Tiedges und Elisas Leben* (Berlin, 1844).

RECKE, Ernst Frederik Vilhelm von der (1848–). A Danish poet, born in Copenhagen. His first lyric drama, *Bertran de Born* (1873), with music by P. Heise, achieved an immediate success at the Royal Theatre and retains its popularity. His other works also show marked dramatic ability. They include: *Lyriske Digte* (1876); *Kong Liuvigild og hans Sönner* (1878), a tragedy; *Knud og Magnus* (1881), a tragedy; *Fru Jeanna* (1891), an opera; *Hertuginden af Burgund* (1891), a play. He also wrote two creditable books on Danish verse, *Principerne for den danske Verskunst* (1881), with which he gained the doctorate, and *Dansk Verslære i kortfattet Fremstilling* (1885).

RECKLINGHAUSEN, rĕk′lĭng-hou′zen, Friedrich von (1833–1910). A German pathologist, born in Gütersloh, Westphalia. He studied at Bonn, at Würzburg, and at Berlin, where he graduated in 1855. He took up pathology under Virchow and did further work in Vienna, Rome, and Paris. After serving as an assistant to Virchow in the Pathological Institute in Berlin, he became, in 1864, professor of pathological anatomy in Königsberg, whence he was called six months later to Würzburg and thence, in 1872, to the University of Strassburg. His researches in pathology, especially of the nervous system, were distinctly valuable. He described the "migrating cells of the tissues" and pronounced them identical with the leucocytes. Among his contributions to medical literature are: *Die Lymphgefässe und ihre Beziehung zum Bindegewebe* (1861); *Ueber die multiplen Fibrome der Haut und ihre Beziehung zu den multiplen Neuromen* (1882); *Handbuch der allgemeinen Pathologie des Kreislaufs und der Ernährung* (1883); *Die Adenomyome und Cystadenome des Uterus und Tubenwandung* (1896).

RECK′ONING (from *reckon*, AS. *ge-recenian*, Goth. *rahnjan*, OHG. *rehhanōn*, Ger. *rechnen*, to reckon; connected with AS. *racu*, account, OHG. *rahha*, thing). In navigation, the reckoning is the calculation of the position of the ship by means of observations of heavenly bodies and the record of courses and distances sailed which is to be found in the log. Dead reckoning (q.v.) is the computation of the ship's position from the record of its movements made in the log without making astronomical observations. See Navigation; Sailings.

REC′LAMA′TION. A term applied to the improvement of land for agricultural purposes by draining or irrigation. Below are listed the larger of the irrigation projects of the United States, with the acreage reclaimed or to be reclaimed. *Arizona:* Salt River, 182,000. *Arizona-California:* Yuma, 158,000. *California:* Orland, 20,000. *Colorado:* Grand Valley, 53,000; Uncompahgre Valley, 140,000. *Idaho:* Boise, 207,000; Minidoka, 120,500. *Kansas:* Garden City, 10,677. *Montana:* Blackfeet, 122,500; Flathead, 152,000; Fort Peck, 152,000; Huntley, 32,405; Milk River, 219,557; Sun River, 174,046. *Montana-North Dakota:* Lower Yellowstone, 60,116. *Nebraska-Wyoming:* North Platte, 129,270. *Nevada:* Truckee-Carson, 206,000. *New Mexico:* Carlsbad, 20,261; Hondo, 10,000; Rio Grande, 155,000. *North Dakota:* North Dakota Pumping, 26,314. *Oregon:* Umatilla, 36,300. *Oregon-California:* Klamath, 70,600. *South Dakota:* Belle Fourche, 100,000. *Utah:* Strawberry Valley, 50,000. *Washington:* Okanogan, 10,099; Sunnyside, 102,824; Tieton, 34,071. *Wyoming:* Shoshone, 164,122. See Aqueduct; Canal; Conservation; Dams and Reservoirs; Drainage; Flume; Irrigation; Pumps and Pumping Machinery; Tunnel; Waste Land; Water Meter; Water Supply.

RECLUS, r*e*-klụ′, (Jean Jacques) Elisée (1830–1905). A French geographer, born in the Gironde. He was educated in Rhenish Prussia and subsequently studied at Montauban and under Karl Ritter at the University of Berlin. His republican principles forced him to leave France after the coup d'état of Louis Napoleon in 1851, and he then traveled in Great Britain, the United States, and South America. After his return to France in 1858 he published the results of his travels and geographical studies in several geographical works and in contributions to the *Revue des Deux Mondes* and the *Tour du Monde*. His repugnance to the Napoleonic reign induced him to join the Internationals in 1869 and, arrested as a soldier of the Commune during the siege of Paris in 1871, he was sentenced to transportation for life. Charles Darwin and other distinguished scientists united in a petition to the French government for his recall, on the ground of the services which he had rendered to science and popular education, and in 1872 his sentence was commuted into one of banishment. He then established himself in Italy and later in Switzerland until he returned to France under the amnesty of 1879. In 1882, however, he was condemned with Prince Kropotkin as a leader and organizer of the anarchist movement and again fled to Switzerland. Twelve years later he was sentenced to transportation for 20 years. While in exile in Switzerland he began his masterpiece, *Nouvelle géographie universelle* (20 vols., 1874–94). This work, which was published in English under the title *The Earth and its Inhabitants*, containing over 3500 maps, in addition to numerous engravings, is an evidence of Reclus's remarkable talent for exposition and his extraordinary scientific knowledge. Of his other geographical works mention should be made of *La terre* (1867; 4th ed., 1877; Eng. trans., *The Earth*, 1871); *Les phénomènes terrestres, le monde et les météores* (1872); *Introduction à la géographie de la France* (1905). In 1892 he became professor of comparative geography at the University of Brussels. At the outbreak of the Civil War in the United States his articles were of conspicuous value in arousing public sympathy in France for the administration of President Lincoln. He was a brother of Paul Reclus.

RECLUS, Paul (1847–1914). A French surgeon, brother of Elisée Reclus, born in Orthez, Basses-Pyrénées. He studied medicine in Paris, graduating in 1876. In 1879 he became hospital surgeon, the next year *agrégé*, and in 1895 professor of clinical surgery in the medical faculty of Paris. He was a member of the Academy of Medicine and was created Commander of the Legion of Honor in 1913. His name is associated with local anæsthesia by cocaine and novocaine and with the disinfection of wounds with tincture of iodine. He is the author, among other works, of *Traité de chirurgie* (1897) and of *Pratique médicochirurgicale* (1907). With Emile Forgue he wrote *Traité de thérapeutique chirurgicale* (1891; 2d ed., 1898).

RECLUSE, rē-klo͞os′ (OF., Fr. *reclus*, from Lat. *reclusus*, p.p. of *recludere*, to shut up, from *re-*, back again, anew + *claudere*, to close). A hermit; more especially one of a class of hermits who, from a motive of special penance or with a view to the more strict observance of Christian perfection, remained shut up from all converse, in a cell or other place of strict retirement. To avoid the danger of the practice of ministering to mere self-will or to fanatical and unbalanced austerity, it was strictly regulated from the middle of the seventh century; and the recluse, who must be a person of tried virtue, was with due solemnity locked up in the presence of the abbot or the bishop, who placed his seal upon the door, not to be removed without the authority of the bishop himself. Nuns also were found to practice the same voluntary seclusion, especially under the rules of the Benedictine, Franciscan, and Cistercian orders. Consult: Ignaz Hauber, *Leben und Wirken der Eingeschlossenen* (Schaffhausen, 1844); L. A. A. Pavy, *Les recluseries* (Lyons, 1875); Armin Basedow, *Die Inclusen in Deutschland* (Heidelberg, 1895).

REC′OGNI′TION (Lat. *recognitio*, from *recognoscere*, to know again, from *re-*, back again, anew + *cognoscere*, from *co-*, together + *gnoscere*, to know). An object is said to be recognized when it appears as familiar. Thus, one recognizes an acquaintance or a locality that has been visited before. It was formerly believed that the process of recognition consisted in part of the reproduction of earlier experience in the form of images. Experiments have shown, however, that this is not necessarily the case and that the one thing essential to the recognitive consciousness is the feeling of familiarity. (See FAMILIARITY.) Recognition is closely related to memory; in the former the feeling of familiarity is aroused by perception, in the latter by idea. (See MEMORY.) Recognition may be of various degrees of definiteness; thus, we may recognize a face as familiar and yet be unable to name or place it; here the perception arouses the feeling of familiarity without associated ideas; or, to take the other extreme, the perception may call up not only the feeling of familiarity, but also a context of images which name, place, and date the original experience.

There are two forms of recognition, direct and indirect. In direct recognition there arises at once a belief that the object perceived is known; i.e., the perception, of itself, immediately calls up the feeling of familiarity. In its indirect form recognition is brought about mediately; i.e., an object is recognized by means of its environment, by reason of the surroundings in which it is set. This takes place when the object itself fails to arouse the feeling of familiarity and is known only through attendant circumstances either past or present. In process of time objects which have become very familiar, such as one's tools, or breakfast table, or writing desk, are taken for granted; they fail to arouse the feeling of familiarity and are apprehended directly. The feeling has faded out, and is replaced by a nervous disposition, very much as is the case in meaning (q.v.). See APPREHENSION.

Recognition has performed a very important biological function in the history of the race. It is one of the means by which the organism adapts itself to its environment. Like many of the more important emotions—fear, anger, sympathy—it is deeply rooted in instinct. The animal learns to trust that which is familiar, that which has stood the test of acquaintance, and to show distrust in the face of the novel and untried. Thus have developed side by side a pleasant aggressive mood of confidence in presence of the known and an unpleasant shrinking mood of diffidence and dislike in presence of the unknown. The refined and modified successors of these instinctive attitudes persist in our feelings of familiarity and unfamiliarity.

Bibliography. Harald Höffding, *Outlines of Psychology* (Eng. trans., New York, 1891); William James, *Principles of Psychology* (new ed., 2 vols., ib., 1905); Oswald Külpe, *Outlines of Psychology*, English translation by E. B. Titchener (new ed., London, 1909); E. B. Titchener, *Text-Book of Psychology* (New York, 1910); Ebbinghaus and Dürr, *Grundzüge der Psychologie* (Leipzig, 1911–13). Important experimental articles upon recognition are those by Bentley and by Whipple in *American Journal of Psychology*, vols. xi, xii, xiii (Worcester, 1899–1901); by Wolfe, Lehmann, and Höffding in *Philosophische Studien*, vols. iii, v, vii, viii (Leipzig, 1886–93); and by Gamble and Calkins, Fischer, and Heine in *Zeitschrift für Psychologie*, vols. xxxii, xxxiii, l, lxii, lxviii (Leipzig, 1903–14).

RECOGNITION MARKS. The bars and stripes of various animals which Wallace thinks serve for recognition by animals of their own species. He claims that color for recognition is "a totally distinct category, to some extent antagonistic or complementary" to protective coloration (q.v.). Recognition colors and markings are prevalent among butterflies and moths, and among them "its chief function may have been to secure the pairing together of individuals of the same species." Recognition marks during flight are very important for all birds which congregate in flocks or which migrate together, and they usually consist of well-contrasted markings on the wings and tail. These markings occur in pigeons, hawks, finches, warblers, ducks, etc., and are illustrated graphically in *Bird Lore*, vol. iii (New York, 1901). Recognition marks occur in many mammals, such as the zebra, many antelopes, gazelles, and allied African forms, including the eland, koodoo, etc.

On the other hand, objectors assert that such stripes and spots are for protection, i.e., concealment (see PROTECTIVE COLORATION), and that they represent "spots or streaks of sunlight passing through foliage or reflected from leaves." Consult A. R. Wallace, *Darwinism* (2d ed., London, 1890), and Pocock, "Antelopes and their Recognition Marks," in *Nature*, vol. lxii (ib., 1900).

RECOGNIZANCE, rē̍-kŏg′nĭ-zans *or* rē̍-kŏn′ĭ-*zans* (ML. *recognoscentia*, from Lat. *recognoscere*, to know again). An obligation entered into by a person with a court of record, whereby he binds himself under a penalty to do or not to do a particular thing required of him by the court, and which is made a part of the record. Recognizances differ but little in form from ordinary bonds, except that they need not be executed with the same formality, as they are entered into before the court, and that they are commonly given by persons under a criminal charge. In many jurisdictions recognizances need not be signed by the person binding himself, as the simple fact of his assent being made a part of the record by order of the court is considered sufficient.

Recognizances are commonly given by prisoners accused of trivial offenses to secure their temporary release, or even permanent release on probation, and, as the term indicates, they imply a recognition or acknowledgment of the offense. The most frequent conditions are that the recognitor keep the peace or appear at some adjourned hearing of his case. In such a case the prisoner is said to be discharged "on his own recognizance."

Recognizances differ from bail bonds in that the latter are usually required to be executed by sureties who can qualify as owning real estate of a certain value. A further distinction is that a recognizance is usually considered as a sort of conditional judgment, and on the default of the recognitor a *scire facias*, or order to show cause, issues to him, requiring him to show good reason why execution should not issue against him immediately for the amount named in the recognizance. In many of the United States bail bonds have entirely superseded recognizances. See BAIL; BOND.

RECOIL (from OF., Fr. *reculer*, from ML. *reculare*, to go backward, from Lat. *re-*, back again, anew + *culus*, posterior; connected with Ir. *cūl*, back). When a gun is discharged the projectile and the gun move in opposite directions with velocities inversely proportional to their weights. The retrograde movement of the gun is called the recoil and is measured in the direction of motion. In order to reduce and equalize the strains on the mounting various devices are employed to absorb the energy of recoil. The recoil is limited to the least practicable distance, taking into account stability of the carriage and the strength and permissible weight of material that can be used to advantage in the construction of gun and carriage. Recoil may be controlled by any one of several different methods or by a combination of two or more, usually the latter. 1. *Raising a weight.* In the Buffington-Crozier seacoast carriage the energy of recoil is partly absorbed by raising a counterweight. 2. The *friction of solids,* between the top carriage and the chassis in which it slides. 3. The *resistance of liquids* or the *resistance of air.* The resistance of liquids is used in most field-artillery carriages. A hydraulic buffer, a long cylinder filled with a viscous material like oil, is attached to the gun. In this cylinder works a piston provided with openings or ports. The piston rod, attached to the piston, is in turn attached to the carriage. On recoil the cylinder moves backward, drawing out the piston rod, the oil being forced through the ports, thus absorbing energy. The French carriage employs a pneumatic buffer. 4. The *compression of springs,* surrounding the piston rod, absorbs a small part of the recoil, the stored energy being used to return the gun to the firing position. 5. In automatic and semiautomatic guns the energy of recoil is partly absorbed *in doing work,* such as opening and closing the breach block, extracting and ejecting the cartridge case, firing the gun, etc. 6. Stability of the carriage is of the utmost importance in field-artillery equipments. With a given muzzle energy and limited weight of gun and carriage, stability has been retained by increasing the length of recoil to about 4 feet for 3-inch guns and by lengthening the trail and lowering the centre of gravity of the system. Such systems are spoken of as "long recoil guns." 7. *Differential recoil* is a system intended to decrease the recoil energy by opposing to it the forward movement and energy of the gun at the moment of firing. Before firing the first time the gun is hauled back against the resistance of powerful springs. Released, the gun moves forward, is fired by a tripper, and, owing to the energy of discharge, recoils in the opposite direction, thus securing a resultant recoil velocity equal to the difference between the normal recoil velocity and the forward velocity imparted by the springs. See BALLISTICS; FIELD ARTILLERY; MACHINE GUN; ORDNANCE.

REC′OLLET (OF. *recollet,* Fr. *récollet,* from Lat. *recollectus,* pp. of *recolligere,* to recollect, from *re-*, again + *com-*, together + *legere*, to gather). A name given to the members of certain reformed bodies of monastic orders, whether of men or women, in the Roman Catholic church. Among orders of men, an offshoot of the Augustinian hermits, which, under Louis de Montaya, in 1530, obtained considerable popularity in Spain, was called by this name, and the order still exists at Medina-Sidonia, León, and Pamplona. The name is also used for the Reformed Franciscans, who were established in France under Henry IV and Louis XIV and spread thence into Belgium, their houses in these countries and Germany becoming so numerous that they reckoned no less than 10 provinces. A reform of the Cistercian Order of nuns in Spain was called by the same name.

RECONNOISSANCE, rē̇-kŏn′ĭ-s*a*ns (Fr. *reconnaissance,* recognition). The military term used to designate the work of troops or individuals when gathering information in the field. Military information may be considered under two general heads, viz., (1) that collected by the general staff in time of peace, and (2) that obtained by troops in the field after the outbreak of hostilities. Reconnoissance begins as soon as the theatre of possible operations is entered and continues throughout the campaign. No matter what other sources of information of the enemy may be available, reconnoissance must be depended upon to obtain the information upon which all tactical movements of troops should be based.

Aëro Squadron. In forces of the strength of a division or larger the aëro squadron will operate in advance of the independent cavalry in order to locate the enemy and to keep track of his movements. Contact with the enemy once gained will be maintained thereafter continuously. This of course presents its special problems which are discussed somewhat fully under *Information* in the article MILITARY AËRONAUTICS.

Cavalry. Reconnoissance in the theatre of operations is best made by the cavalry, which from the beginning of the campaign seeks to determine the enemy's strength and dispositions. *Independent cavalry.* Reconnoissance by the independent cavalry will give, in a general way, the enemy's location for several hours or even days preceding contact of the main bodies. On very wide fronts an army is generally covered by two or more bodies of independent cavalry. *Divisional cavalry.* The cavalry attached to an infantry division is called divisional cavalry. When the division forms part of a field army, the divisional cavalry is known as advance cavalry. It usually enters into the composition of advance, flank, rear, and outpost guards (q.v.), and when so employed is known as advance guard, flank guard, rear guard, and outpost cavalry, as the case may be, and performs such reconnoissance as the situation demands. Though its reconnoissance is more restricted than that of the independent cavalry, advance cavalry goes more into detail and gathers information as to the resources of the country, roads, camping places, etc. As combat becomes more imminent the advance cavalry must be active to guard against surprise, gain information of the enemy's movements, and prevent incursions of his patrols.

Infantry. The extent of the infantry reconnoissance will not be so great when the aëro squadron and the cavalry are able to perform the service efficiently. In no case, however, can infantry reconnoissance, preceding or during combat, be dispensed with. Infantry and artillery must conduct their own close in reconnoissance for their own security and for immediate tactical dispositions. Reconnoissance immediately preceding combat is of vital importance as combat orders are based on the information then obtained. The strength of the force employed is determined by the character of the information desired and by the strength of the hostile screens. To obtain the information may require a reconnoissance in force, which may then become the opening phase of the attack itself. In an advance the advance guard (q.v.) must be relied upon to make the enemy disclose his strength and position as soon as possible. A strong force of artillery is most useful for this purpose as it clears up the situation in a way that cannot be done by other troops except by incurring heavy losses. Reconnoissance during combat is kept up by the infantry to maintain contact with the enemy, to acquaint itself with the terrain in its front, and especially to protect its flanks and rear. The field artillery continues the reconnoissance called for by its tactical employment. Reconnoitring patrols (see PATROL) are used to insure effective work.

Military air craft of all kinds are employed under the direction of the commander of the forces. (See MILITARY AËRONAUTICS.) Free balloons are little used. Captive balloons may be used for tactical reconnoissance, for operation of artillery fire, and for signaling. Large dirigible balloons are of practical value for strategical reconnoissance; they are also suitable for carrying a number of observers, radio equipment, machine guns, and explosives. Aëroplanes are more dependable for field service with a mobile army. Reconnoissance by aëroplane includes strategical and tactical reconnoissance and the observation of artillery fire. Aëroplanes are also used to prevent hostile aërial reconnoissance. Strategical reconnoissance by aëroplane is effective within a radius of 150 miles from the starting point and is for the purpose of determining strength, position, and direction of advance of hostile forces. Aëroplanes are safe from fire at altitudes of 4000 feet or more. The information obtained by reconnoissance may be transmitted (1) by wire (telegraph, buzzer, telephone), (2) by visual signaling (flag, helio, night lamp), (3) by radio telegraph, (4) by messenger (foot, mounted, cycle, motor car, flying machine). Consult *Field Service Regulations of the United States Army, 1914*.

Topographical Reconnoissance includes suitable means for obtaining and recording all needful information of a terrain in the shortest possible time and within the limits of accuracy required for the operations of troops in the field. The term also technically includes the interpretation of a record, when made, to determine from it the favorable or unfavorable effect of the terrain for the purpose of directing military operations with reference thereto. The information to be obtained in a topographical reconnoissance may be grouped under the headings of time, cover, resources, and nomenclature. The map should permit a determination of the time which a column will require to pass between any two given points by showing the distance between them and the condition of the road or country which must be traversed, as regards its effect on the rate of march; the accidents of ground which will afford cover to the army or to the enemy; the location, quantity, and quality of water, fuel, grass, etc., and should give to each feature its local name. The last requirement is of great importance and is the one most often neglected. Consult *Engineer Field Manual*, published by the United States War Department (Washington, 1904 et seq.).

RE'CONSTRUC'TION (from Lat. *re-*, back again, anew + *com-*, together + *struere*, to heap). In American history, the process by which, after the Civil War, the seceded States were restored to their normal relations with the Union. The only provision of the Constitution that seemed to have any bearing on the matter was that which makes it the duty of the United States to guarantee to every State in the Union a republican form of government. Even this was not explicit, for it was not stated which branch of the government, whether the Executive or Congress, was charged with the execution of the constitutional mandate. Among the views as to the status of the States at the close of the war several deserve a brief explanation. First, there was the Southern view, based on the assumption that the acts of secession were invalid and of no effect. Its cardinal doctrine was the indestructibility of a State, either by its own act or by act of the United States government. All that was necessary, therefore, to the reëstablishment of normal relations with the Union was for the State governments to cease their resistance to the government of the United States and to repeal all measures passed in furtherance of secession and rebellion. Second, there was the view of President Lincoln, based on the assumption that the act of rebellion in each State was the act not of the State itself, but of combinations of disloyal persons who had unlawfully subverted the loyal State governments. The States, therefore, continued to exist as members of the Union, though they were out of their "proper practical relations" with it. According to this view the problem of reconstruction consisted simply in placing the loyal element in the seceded States in control of the State governments which had been subverted by the disloyal element. Furthermore, President Lincoln regarded the problem as one devolving upon the Executive rather than upon Congress, for the work of creating a loyal element necessarily involved the exercise of the pardoning power, which alone was vested in the President, and the support by the military arm of the loyal governments so established. Thirdly, there was the congressional view, which held that reconstruction was a legislative problem; that as a result of rebellion the Southern States were "deprived of all civil government" and that all de facto governments set up during the war were illegal. This view has been called the forfeited-rights theory. The States continued to exist, but as disorganized communities subject to the paramount authority of the United States. This was a compromise theory and was the one which finally predominated. The theory differed chiefly from Sumner's by insisting that the States still existed, but with power and rights suspended, and from the presidential theory by leaving the task of reconstruction entirely to Congress. In pursuance of this view Congress passed an Act in July, 1864, which was fathered by Henry Winter Davis in the House and Benjamin F. Wade in the Senate and which provided a remedy for the defects of the presidential scheme as understood by the supporters of the congressional view. The view embodied in this measure differed from that of President Lincoln, first, in regarding the problem of reconstruction as a legislative problem; second, in requiring the loyalty of a majority of the adult white males of the State for the basis of the reconstructed government instead of the loyalty of one-tenth, as required by President Lincoln's plan; thirdly, in requiring the abolition of slavery as the starting point in the process of reconstruction. President Lincoln refused to sign the bill before the expiration of the session, thus indirectly defeating it. A fourth view was the so-called State suicide theory of Charles Sumner, enunciated by him in a series of resolutions offered in the Senate in 1862. The gist of these resolutions was that the attempt of a State to secede from the Union, involving as it did an attempt to exclude the Constitution of the United States from the territory of the State, was, if successfully sustained by force, equivalent to a practical forfeiture by the State of all rights under the Constitution. It involved, furthermore, the immediate extinction of the State sovereignty and its reduction to the position of a Territory under the exclusive jurisdiction of the government of the United States. Sumner was supported by many able men, and his theory was in line with the doctrine of strong nationality to which the war gave a decided impulse. Finally, there was the view ably expounded by Thaddeus Stevens, who was more severe towards the South than Senator Sumner, and popularly called the conquered-province theory, according to which rebellion against the national authority by a State of the Union not only put an end to its existence as a State, but even forfeited its rights as a Territory under the Constitution. The inhabitants of such a community were remanded to the status of an unorganized province owned by the national government and subject to its dominion without the restraint of constitutional limitations. The advocates of this theory appealed to the actual facts of the case to show that at the close of hostilities the Southern States were in the condition of dependent provinces subject to the absolute dominion of the conqueror.

Of the several theories advanced that held by President Lincoln was the first to receive favorable attention. In 1862, portions of Louisiana, Arkansas, and Tennessee having been recovered by the Federal armies, the President appointed military governors in those districts with somewhat vague and undefined powers. In general they were to take the initiative in the movement to reëstablish civil governments and prepare the way for representation in Congress. In his third annual message (Dec. 8, 1863) the President announced a more definite and systematic plan of reconstruction, to which was appended a proclamation of amnesty offering a full and complete pardon to all who would take an oath to support the Constitution of the United States and the Union of the States thereunder, as well as all acts of Congress passed during the war and all proclamations of the President with reference to the slaves. From the benefits of the amnesty were excluded certain classes of men who had held high military or civil offices under the Confederate government or who had left the service of the United States to engage in the rebellion. He then proposed to restore the State governments in the seceded States to the amnestied class by declaring that whenever a number of persons not less than one-tenth of those who had cast votes in such State at the presidential election in 1860 had taken the oath, if they were qualified voters by the State law in force at the time of secession, and had reëstablished a State government republican in form, such government should be recognized by the Executive as the true government of the State, and presidential support would be given to its measures to regulate the life of the freedmen, provided emancipation was recognized. He said, however, that whether members sent to Congress from any State so reconstructed should be admitted to their seats rested exclusively with the two Houses. The proclamation did not apply to Virginia, both the President and Congress having from the first recognized the loyal Pierpont government at Alexandria as the true government; nor did it apply to Missouri and Kentucky. Ten per cent governments, so called, were accordingly established in Louisiana and Arkansas in the following year. In the former State 13 parishes, including New Orleans, were in Union hands. In December two districts elected Congressmen who were allowed seats in the House. In 1864 Arkansas established a reconstructed government like that of Louisiana. In Tennessee the President's plan of reconstruction was put into operation early in 1865. Representatives were chosen to Congress, but they were refused admission to their seats in December, 1865. In the meantime Congress had assumed the right to take in hand the matter of reconstruction and had passed the Wade-Davis Bill, to which reference has already been made. In February, 1865, it also passed a resolution which prohibited the counting of any electoral votes for President or Vice President in the election of 1864 from States restored under Lincoln's plan. Congress also passed the Twenty-second Joint Rule, by which the consent of each House was necessary to count the disputed electoral vote of a State. This measure gave the radicals a strong grip on the presidential elections and remained in force until 1867. The refusal of the President to sign the Wade-Davis measure, and his proclamation in regard to the subject in which he stated his objections to the setting aside of the constitutions and governments in Louisiana and Arkansas, made a breach between the President and Congress inevitable.

After the assassination of President Lincoln President Johnson took up the policy of his predecessor without material change, and on May 29 issued a proclamation of amnesty and pardon to all persons who had neglected to avail themselves of the benefits extended by the amnesty proclamation of President Lincoln. His proclamation of amnesty differed from that of President Lincoln only in the enlargement of the classes of excepted persons. Besides those who had held high rank in the Confederate military and civil service and those who had resigned positions in the service of the United States to enter the rebellion and a few other classes, President Johnson excluded all who had voluntarily taken part in any capacity in the Confederate service and who were the owners of taxable property of the value of more than $20,000. Persons excluded from the benefits of the amnesty were allowed to make special application to the President, who promised that such clemency would be extended as appeared to be consistent with the facts of the case and the peace and dignity of the United States. By subsequent proclamations the President appointed provisional governors for the States of North Carolina, Mississippi, Georgia, Alabama, South Carolina, and Florida, and directed them to call constitutional conventions in their respective States for the purpose of restoring the said States to their constitutional relations with the United States. The heads of the several executive departments were at the same time directed to put the laws of the United States into operation in these States, and the United States judges were required to open the courts and to proceed with the business on their dockets. President Johnson regarded the States of Virginia, Louisiana, Arkansas, and Tennessee as already reconstructed, and therefore provisional governors were not appointed for those

States. During the summer and autumn of 1865 conventions were held in all the States not yet reconstructed, except Texas, which acted in the spring of 1866; and when Congress assembled in December of that year they all had passed ordinances either repealing the ordinances of secession or pronouncing them null and void *ab initio;* they all had abolished slavery by constitutional amendment, and all but South Carolina had passed ordinances repudiating State debts incurred in aid of the rebellion. These steps were taken by advice of the President, who declared that they were necessary to satisfy the North. They had, moreover, held elections for members of the Legislature, for State officers, and for members of Congress, and the Legislatures had met and with two or three exceptions had chosen United States Senators and, with the exception of Mississippi, had ratified the Thirteenth Amendment to the Constitution of the United States. When, therefore, Congress met in December, the President was able to inform that body that all the States except Texas, whose convention did not meet until March, 1866, "had been reconstructed and were ready to resume their places in the two branches of the national Legislature."

Congress, however, did not accept the view of the President, but appointed a joint committee of nine Representatives and six Senators to inquire into the condition of the seceded States and to report by bill or otherwise whether any of them were entitled to representation in Congress. Pending the report of the committee and the action of Congress thereon, it was resolved that no member should be received into either House from any State lately in arms against the United States. The chief reason for the rejection of the President's plan was the character of the police legislation passed by several of the Southern Legislatures in the autumn of 1865. On account of the general demoralization of the freedmen after emancipation, together with their habits of improvidence and shiftlessness, all the Southern States passed stringent police measures to prevent disorder and pauperism among them. These new black codes did not grow out of a feeling of hostility to the blacks, but out of a deep-rooted view of social life. To the Southerners such provisions were absolutely necessary for bringing into orderly relations a mass of crude and disorganized people. One of the chief objections urged against these laws was that in most cases they applied only to the negro race. In Mississippi, e.g., negroes were prohibited from renting or leasing land in incorporated towns and they were allowed to be competent witnesses only in cases at law in which they were parties. Other Southern Legislatures followed the example of Mississippi, though none of them went quite so far in repression. The Republicans in Congress professed to see in these measures an attempt to reënslave the freedmen of the South. In the meantime the Thirteenth Amendment, abolishing slavery, had secured the ratification of the requisite number of States and had been promulgated by the Secretary of State as the law of the land. In March, 1866, Congress passed the Civil Rights Bill (q.v.) conferring the rights of citizenship upon the freedmen. This Act established complete equality in the enjoyment of civil rights for all citizens without respect to color or race. On March 27 President Johnson vetoed the bill, but early in April Congress passed it over his veto. About the same time Congress passed a measure to enlarge the powers of the Freedmen's Bureau (q.v.). It too was vetoed, and was not passed over the veto. In July another measure for the same purpose was passed, was vetoed by the President, and passed over his veto. In the meantime Congress was debating a proposition to amend the Constitution so as to place beyond the reach of any subsequent Congress the provisions of the Civil Rights Bill. In June the proposed amendment secured the necessary two-thirds majority of both Houses and was sent to the State Legislatures for ratification.

In the same month the Joint Committee on Reconstruction made its report declaring that the seceding States had deliberately abolished their State governments and constitutions so far as these connected them with the Union and were consequently disorganized communities, and that guarantees of future security should be required as an essential condition of restoration to normal relations with the Union. The committee recommended denial of representation to these communities until "sufficient guarantees were provided which would tend to secure the civil rights of all citizens, temporary restoration of suffrage to those not guilty of participation in the rebellion, and the disqualification from office of at least a portion of those whose crimes have proved them to be the enemies of the Union and unworthy of public confidence." During the period intervening between the report of the joint committee and the reassembling of Congress a riot had occurred between the white and black races in New Orleans, resulting in the death of 40 or 50 persons and the wounding of 160 others, and the President in the course of a journey to Chicago had used indiscreet language in his criticism of Congress. Perhaps if he had accepted the Freedmen's Bureau Bill he would have drawn to his side the more conservative of his opponents and reduced the power of the radicals into safe bounds. When Congress met in December, 1866, it made an unsuccessful effort to impeach the President, and then, in order that the President might be prevented from carrying out his policy of reconstruction, enacted a law requiring the new Congress, which contained a large majority opposed to the Executive policy, to meet on March 4, 1867. Next it passed the Tenure of Office Act (q.v.) to limit the President's power of removal. It then passed acts establishing negro suffrage in the District of Columbia and in the Territories. Finally it practically deprived the President of his power of command over the army and vested it in General Grant, whose position was further made irremovable.

Meantime Congress was spurred on by the action of all the Southern States except Tennessee in rejecting by votes nearly or quite unanimous the proposed Fourteenth Amendment. It now took up the work of reconstruction in earnest, showed little or no disposition to yield to the views of the President, and in February passed an "Act to provide for the more efficient government of the seceded States," assigning as a reason that "no legal State governments or adequate protection of life, liberty, or property existed in those States, and that it was necessary that peace and good order should be enforced in them until loyal and republican State governments could be legally established." The bill was promptly vetoed by the President, and on the same day was passed over his veto. The Act divided the 10 seceding States into five military districts, as follows: (1) Virginia; (2) North and South Carolina; (3) Georgia, Florida, and Alabama; (4) Mississippi and Louisiana; (5) Arkansas and Texas. Tennessee was not in this arrangement, for in 1866 it accepted the Fourteenth Amendment and was recognized in full fellowship. Each district was to be under the command of an army officer not below the rank of brigadier general, appointed by the President and charged with the duty of protecting all persons in their rights of person and property, of suppressing insurrection, disorder, and violence, either by military commission or through the local courts. In the meantime the existing civil governments were to be deemed as provisional only and subject to the authority of the United States. The Act also contained provisions for the calling of a convention by all the people of the State, regardless of race or color, with a view to restoration in the Union. By a supplementary Act passed March 23 by the new Congress, the voluntary action of the States was anticipated and the process of reconstruction hastened. This measure directed the district commanders to cause to be registered as voters all persons, without regard to race or color, not disqualified by participation in rebellion; to hold an election for delegates to a State convention; and if a majority of the registered voters were in favor of holding a convention, to call it together for the purpose of adopting a new constitution. As soon as the constitution was ratified by a majority of the registered voters it was to be transmitted to Congress, and if it were approved by that body, the State was to be readmitted to representation in Congress. The President promptly vetoed the Act on the ground that some of its provisions were without constitutional warrant, that it purposed to disfranchise the great body of respectable whites, and that it conferred the suffrage on the mass of ignorant freedmen. With equal promptness the measure was passed over the executive veto. The President, despite his hostility to the Act, at once appointed the district commanders, his first appointees being Generals Schofield, Sickles, Ord, Thomas, and Sheridan. These officers with military commands assumed control of their respective districts and immediately put into operation martial law. Orders were issued in every district for the regulation of various matters of private law and for the prevention of discrimination against the blacks. Boards of registration were appointed in each county and the work of registering the new electorate was soon in full progress. Existing State officials who obstructed the registration of the negroes were promptly removed. In 1868 Governor Jenkins, of Georgia, and Governor Humphreys, of Mississippi, were removed for opposing reconstruction. The body of existing laws were continued unless they conflicted with reconstruction acts. Military tribunals, however, were freely created for various kinds of crime. In November, 1867, General Hancock supplanted General Sheridan in the fifth district, the administration of the latter having been unduly strict. In the early winter of 1867 elections were held in all the military districts, and by February, 1868, conventions were in session in every Southern State that had seceded from the Union. The constitutions drafted by these bodies reflected the views of the delegates, a majority of whom in most instances were freedmen and Northern Republicans who had emigrated to the South after the war and who came to be called in derision carpetbaggers. The constitutions drafted by them provided equality in civil rights and in some cases undertook to secure social advantages for the blacks. They established negro suffrage and in most cases disfranchised those whites whom the proposed Fourteenth Amendment would disqualify from holding office. In several States those who had violated the rules of civilized warfare or had voted for secession were likewise disfranchised. Everywhere except in Mississippi, Texas, and Virginia reconstruction constitutions were promptly ratified by the new electorates. In Mississippi, on account of several provisions of a proscriptive character in the new constitution, a determined and systematic campaign was undertaken by the whites for the purpose of defeating ratification. By the aid of a considerable proportion of the colored voters they were successful, and the State was left to continue for a while longer under military rule. In Texas and Virginia the obnoxious features of the constitutions created such strong opposition that the reconstructionists were induced to delay indefinitely the submission of those instruments, and these States likewise continued under military rule. In the other States, the constitutions having been duly ratified and the Fourteenth Amendment adopted by the newly constituted Legislatures, Congress on June 22, 1868, readmitted Arkansas into the Union, and on June 25 Georgia, North Carolina, South Carolina, Florida, Alabama, and Louisiana. The Fourteenth Amendment was also declared by the Secretary of State to have been adopted by the requisite number of States and was accordingly promulgated as a part of the Constitution. In the meantime the Georgia Legislature had rejected the negro members elected to that body, and the United States Senate thereupon refused admission to the Senators from that State after the Act of June 25 had declared the State reconstructed. Thus at the time of the accession of General Grant (1869) to the presidency four of the States were still unrestored to their full places in the Union. He at once recommended to Congress the submission of the constitutions of Virginia and Mississippi to the people in such a manner as to enable them to vote separately upon the obnoxious provisions. Congress acted upon the President's recommendation and the constitutions were promptly ratified without the objectionable clauses. By the same Act Congress authorized the President to submit the constitution of Texas to the voters, which was done, and it too was ratified. In the cases of these three States, however, Congress imposed an additional condition which had not been required of the other reconstructed States, viz., the ratification of the Fifteenth Amendment. In January, February, and March, 1870, respectively, Virginia, Mississippi, and Texas were restored to their full positions in the Union, but subject to certain conditions which to some extent impaired their equality with the original States. Finally, after being twice reconstructed, Georgia complied with the new conditions imposed by Congress, and by an Act of June 24, 1870, was again restored to her place in the Union and military government was withdrawn.

From the technical point of view reconstruction was now complete, but the consequences of what has come to be generally recognized as a mistaken policy were destined during the ensuing years to be far-reaching in their effects upon the reconstructed States. As a result of the disfranchisement of large classes of whites and the enfranchisement of the negro race, which outnumbered the whites in some of the Southern States, the local and commonwealth governments fell into the hands of unscrupulous adventurers from the North and West, who controlled the colored vote and excluded the native whites from participation in the administration of the government. Negroes who but a few years earlier were in slavery now filled up the Legislatures, held many of the executive offices, many of the minor judicial positions, and in some cases occupied seats on the benches of the higher courts. An era of extravagance, amounting to outright plunder in some States, now set in. Legislative sessions were frequent and long drawn out, the members voting themselves a large per diem as compensation for their services. Bulky codes were enacted and numerous offices, amounting to sinecures in many cases, were created for the benefit of the carpetbaggers, who now came in great numbers to the South. The rate of taxation everywhere was increased out of all proportion to the ability of the people to pay in their then impoverished condition. In Mississippi the rate rose from 1 mill on the dollar to 14, and resulted in the confiscation of one-sixth of the entire land of the State for nonpayment of taxes. In most of the States large debts were created for projected improvements, many of which were never carried out. In Louisiana and South Carolina a wholesale system of plunder was inaugurated. Soon disorders began to arise in all the Southern States, and presently the Ku-Klux Klan (q.v.) was organized to terrorize the negroes and exclude them from the enjoyment of their newly acquired political rights. The disorder became so great that Congress was called upon to take action to preserve order and protect the blacks. By the so-called Enforcement Act of 1870 the Federal courts were given jurisdiction of a series of offenses committed with the intention of denying equal rights to any citizen of the United States. The Federal district attorneys now bestirred themselves throughout the South, and many indictments were found under the Act, but few convictions followed. In the following year Congress passed the so-called Ku-Klux Act, which authorized the President to suspend the writ of habeas corpus and employ military force for the suppression of violence in any community. At the same time a committee of Congress was appointed to investigate "affairs in the late insurrectionary States." A mass of evidence, taken by subcommittees, who visited the South, was published in 12 volumes. One result was that the Klan was soon generally abandoned. Acts were also passed providing for Federal supervision of elections, and finally, in 1875, an Act was passed to secure equality of treatment to negroes in theatres, railway cars, hotels, and other public places. This Act, however, as well as the chief provision of the Ku-Klux Act, was declared by the Supreme Court to be unconstitutional, not being within the power of Congress. As the extravagance and corruption of the carpetbag governments increased, the determination of the whites to regain control of affairs became fixed. The withdrawal of the military forces from the South left the reconstruction governments without power to maintain themselves. Already by 1870 North Carolina, Tennessee, Texas, Georgia, and Virginia had been reclaimed from the Republicans. Meantime the wholesale removal of political disabilities by Congress restored to public life many old and respected citizens of the South. This, together with the division of the Southern Republicans into conservative and radical wings, the former coalescing with the Democrats, made possible Democratic success. In 1874 Alabama and Arkansas went Democratic, and the carpetbag governments in those States came to an end. In the following year a great campaign was waged in Mississippi, not unaccompanied by violence, intimidation, and even riots, but which resulted in the defeat of the Republicans. The Mississippi plan was applied with success, in 1876, to the three remaining States of Louisiana, South Carolina, and Florida. The redemption of the Southern States was now complete and was followed by a general emigration of the carpetbaggers to the States of the North and West. The subsequent virtual disfranchisement of the negro race in the South marks the final recession from the status established by the process of reconstruction.

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REC'ORD (OF. *record, recort*, from ML. *recordum*, witness, record, judgment, from Lat. *recordari, recordare*, to remember, call to mind, from *re-*, back again, anew + *cor*, heart), JUDICIAL.

A written history or account of the entire proceedings in a case. The importance of keeping such records was not recognized until long after regular tribunals of justice had been established. It seems to be undisputed that William the Conqueror introduced the practice into England. At the early common law it was the custom for the proper court official to enter upon pieces of parchment the pleadings and a brief account of all the steps and proceedings taken in the action, including the judgment. These various pieces were attached together in regular order and wound into a spiral roll for convenient safekeeping. This was known as the judgment roll, and this term is still applied to the various pleadings and papers, including the judgment, when filed together as a part of the record. Afterward the records were kept by writing them in books instead of on parchment, and in a few jurisdictions to-day every item of a judicial record is entered in books which become the public records of the court. However, in many jurisdictions the record of a case is composed partly of entries in the clerk's books and partly of the original pleadings and judgment filed in the proper office.

A complete judicial record of an action should contain, in some form, the date of issue, the pleadings, the various necessary steps taken before trial, a minute of the fact of the trial, the appearances for the parties, the name of the judge before whom the cause was tried, the verdict of the jury or disposition by the court, and the final judgment. Under most practice acts the successful party, in order to enforce his rights under the determination of his case by the court, must attend to the entry of judgment by presenting to the clerk of the court an instrument containing a statement of the determination of the action and an order for the proper relief, which is then signed by a judge or a clerk for the court and entered. The record of a court is conclusive evidence of the facts which it sets forth as between the parties thereto, and cannot be attacked collaterally. See PLEADING; PROCEDURE; RES JUDICATA; and consult the authorities referred to under PLEADING; PRACTICE.

REC'ORDE, ROBERT (c.1510–58). A British mathematician, born at Tenby, Wales. He was educated at Oxford and was elected fellow of All Souls in 1531. He graduated in medicine at Cambridge in 1545. In London he is said to have become court physician. He became comptroller of the mint at Bristol (1549) and general surveyor of the mines and money (1551). He died while imprisoned for debt in King's Bench Prison, Southwark. Recorde was one of the first in England to adopt the Copernican system, then in its infancy. He was the first to introduce algebra into England, and his views of the science were very advanced for the time. His invention of the sign of equality, =, given in his *Whetstone of Witte*, and his method of extracting the square root of polynomials, are the only evidences of originality generally recognized by mathematicians. The equality sign may have been suggested to him from its use as a mediæval abbreviation for *est.* His chief works were: *The Grounde of Artes* (c.1540, and frequent editions until 1699); *The Whetstone of Witte, or the Second Part of Arithmetike* (1557), a work on algebra; *The Pathway to Knowledge, or the First Principles of Geometry* (1551); *The Castle of Knowledge: A Treatise on Astronomy and the Sphere* (1551).

RECORD'ER. In England, the sole judge of a borough court of Quarter Sessions and frequently judge of a borough civil court of record. The recorder does not take charge of the administrative duties of the Court of Quarter Sessions (q.v.). In most boroughs he may practice law, as his salary is often merely nominal. He is appointed by the Home Secretary in the name of the crown. The title of recorder is also applied to the chief judge of the Lord Mayor's Court (q.v.) of London and to one of the judges of the Central Criminal Court.

The title is now seldom employed in the United States. The principal instance of note is in New York, where one of the judges of the Court of General Sessions is called the recorder. He devotes his entire time to his duties, just as the other criminal judges, not being allowed to practice. It is an elective office.

RECORDER. The name of a musical instrument formerly in use in Great Britain, somewhat like a flageolet, but with the lower part wider than the upper and a mouthpiece resembling the beak of a bird. Its pitch was an octave higher than the flute and it had a pleasing tone. Its compass was about two octaves, from f^1 to f^3. Consult Christopher Welch, *Six Lectures on the Recorder* (London, 1911).

RECORDING ACTS. See RECORDING OF DEEDS; TITLE, REGISTRATION OF.

RECORDING OF DEEDS. The public registration of instruments of title. At common law the transfer of title to real property by livery of seisin (q.v.) was a public and notorious act, making unnecessary any formal public record of the transaction. The modern practice of recording transfers of property on public records was therefore unknown to the common law. The Statute of Uses (27 Hen. VIII, c. 10), which made permissible the conveyance of real estate by deed privately executed, gave rise to the necessity of some method of publicly recording all instruments of conveyance. The first step in this direction was taken by the Statute of Enrollments (27 Hen. VIII, c. 16), which provided for the recording of all deeds of bargain and sale. As the statute did not in terms apply to leases of real estate, the lawyers of the time speedily invented a method of evading the statute by means of conveyance by lease and release (q.v.). The Statute of Enrollments thus became practically inoperative almost from the time of its enactment. A later statute (7 Anne, c. 20) required the recording of deeds of all real estate located in the County of Middlesex, and this was followed by some other acts of Parliament having a purely local application. There is, however, no statute in England of general application requiring that deeds be recorded, and the practice of recording deeds has never become common in that country.

In the United States from the earliest time statutes have been enacted providing for the recording of conveyances of real estate, and now in all the States there are statutes providing for the recording of all deeds or instruments affecting the title to real estate, and in certain cases of instruments affecting the title to personal property. Thus, generally, deeds, leases, mortgages, assignments, and releases of mortgage, wills, *lis pendens*, mechanics' liens, and liens upon or affecting real estate may be recorded. And in many States mortgages and conditional sales of personal property may also be recorded. The method of recording is usually prescribed by statute. Generally the document is transcribed at length on public record books provided for the purpose. The designated place of record is usually, in case of real estate, the county clerk's, or register's, office of the county in which the property is located, or, in case of personal property, the corresponding office of town or city in which the property is located or where the mortgagor or owner resides, or both; and there are numerous special provisions governing the recording of instruments affecting transitory property, as vessels, canal boats, and the like. To be entitled to record an instrument must be properly executed, and it is generally required that it shall be acknowledged before a notary or a corresponding public officer. It is generally deemed to be recorded from the time it is filed in the office of the public officer whose duty it is to record the instrument.

The effect of recording a deed or conveyance in accordance with the various recording acts is to give constructive notice of the deed or conveyance to all who deal with the property. Recording a deed is not necessary to determine the rights of those who are parties to it and their privies; but if the deed is not recorded a subsequent purchaser who has recorded his deed and who had no notice of a prior conveyance will be deemed to have title rather than the first purchaser who did not record his deed. In other words, as between two innocent parties claiming from the same grantor he who first records his deed has the better title.

Unless the recording act specifically otherwise provides, creditors levying on property or those buying with notice of a prior conveyance will not be protected by the recording act, but will acquire only such rights as the debtor or grantor had at the time. The effect of the recording acts, therefore, is to make the public record the conclusive record of the ownership or interest in real property to all who rely upon it, and any one who deals with the property, except a creditor or one having actual notice of an unrecorded instrument affecting the property, may rely upon the state of the public record on the date of taking a deed or conveyance as determining completely the right or interest which he acquires. In England, owing to the practice of not recording instruments of conveyance, it is usual to give the buyer of real estate who is entitled to receive them all the conveyances affecting the property as muniments of title. In the United States this is not necessary or usual, as the public record is sufficient evidence of the title, and the buyer is entitled only to the grantor's deed of conveyance.

RECORDS, Public. In the broadest sense, a public record is a written account, history, or memorandum of a fact or event of general public interest, made by a public official in the performance of his duties and intended to be preserved as permanent evidence of the matters to which it relates. However, the term is usually confined to authenticated accounts of legislative acts and proceedings, the judgments and records of proceedings of courts of law, and the originals or copies of wills, mortgages, and conveyances, preserved in a public record office.

The nations of remote antiquity had very little idea of preserving these memorials for the public benefit. Accounts of the doings of the rulers were indeed preserved, as by the clay tablets of Nineveh and Babylon, but they recorded merely military expeditions or the splendor of the monarch, rather than laws or other matters affecting the general public. However, with the progress of civilization, it became customary to promulgate laws and preserve them in writing in some royal repository, and these were the first true public records. No provision was made for their inspection by the public, and where it was desirable to promulgate a law affecting the people in general, it was usually written upon parchment or some more indestructible substance and posted in a public place, or communicated to those in authority in various districts and proclaimed by them, through their subordinates or deputies, to the people in their respective districts. Thus, in 303 A.D. the principal laws of Rome were painted on 12 wooden boards, known as the Twelve Tables and exhibited in the Forum. During the mediæval ages the laws were usually written on parchment and preserved by certain public officials, but no systematic record of judgments or conveyances was kept. The French were probably the first nation to keep judicial records in the sense in which we employ the term now, and the Normans introduced the practice into England.

Under the feudal system the method of conveying land was by feoffment with livery of seisin, a sort of dramatic ceremony on the land itself, and written conveyances were not generally employed until after the Statute of Uses, 27 Hen. VII, c. 10. By 27 Hen. VIII, c. 16, known as the Statute of Enrollments, it was provided that conveyances by bargain and sale should be enrolled. This Act was the basis of the recording acts in England and the United States.

England has the most complete collection of public records of all of the older nations of the world. However, until 1838, these records were so negligently kept that many valuable ones were destroyed or lost. The oldest English records are the tallies in exchequer, which were made by means of wooden sticks marked on one side with notches to indicate the sum for which the tally was an acknowledgment, while on the other two sides were written the amount, the name of the payer, and the date of the transaction. This rude contrivance was probably of Norman-French origin, the name being derived from the French *tailler* (to cut). This practice continued until 1783, when the Statute of 23 Geo. III, c. 82, abolished the office of tally cutter and substituted indented paper checks as receipts for payments into exchequer.

During the Norman period the parliamentary records were in the Norman-French language and were written on parchment. This language continued to be used for parliamentary records until the fifteenth century, and Latin was in common use in judicial records until the reign of George II. One of the most noted ancient records is the Domesday Book (q.v.). Such records as had been kept by the Saxons prior to the Conquest had been preserved by the clergy in monasteries and religious houses, and this practice was continued as to many important records for centuries. Many copies of the Magna Charta were put under the great seal and delivered to the archbishops for safe keeping.

During the reign of the Conqueror and his immediate successors great progress was made in the matter of keeping public records. The elaborate system of feudal tenures introduced by William necessitated records in order to protect the King in his rights to military and other services, taxes, etc., and also in the interests of the great lords of the realm. The early court records were scattered about in the various palaces where the kings sojourned during their visits to the different parts of the Kingdom. This was due to the fact that the principal court, the Curia Regis, followed the King's person. Upon the permanent establishment of the higher courts at Westminster the court records were deposited in the cellars of Westminster Hall, which were damp and ill adapted for the purpose. A large number of valuable records were also deposited in the Tower. At various times since the thirteenth century the preservation, arrangement, and indexing of the records has been agitated in England. In 1800 a parliamentary committee accomplished a great deal in the way of discovering and arranging ancient public records. Various commissions supplemented this work, between the latter date and 1835, when a parliamentary committee, appointed for the purpose, made a complete investigation of all that had been previously done in this regard, and their report was the basis of subsequent legislation. The statute of 1 and 2 Vict., c. 94, restores to the Master of the Rolls his ancient authority as chief custodian of the court records, giving him in addition the charge of all the records of the Kingdom. The Act also provided for the establishment of a public record office and for the erection of suitable buildings and authorized the Master of the Rolls to appoint deputies and assistants and to take all necessary steps for the careful preservation of all public records. Provision has been made for the reasonable inspection of records, and authenticated copies may be obtained, which will be received as evidence by the courts.

The United States started with the English methods of keeping public records from its beginning, and no nation pays more attention to the preservation of these muniments of private rights. In all States deeds, mortgages, etc., are required to be recorded to protect a title to land, and practically all instruments affecting property, real or personal, must be recorded in most States. Judicial records are kept by the clerks of the various courts. The statutes, etc., are kept by the State officials, and are open to public inspection. The Federal government carefully preserves the Declaration of Independence and all Federal papers and documents. Each State, county, and municipality makes provisions for the safe-keeping of its own records.

By the common law the general public had no absolute right to examine records preserved by the governmental authorities. For example, a person could not demand to see a record of title to real estate simply because he desired to make an abstract thereof out of curiosity or for historical research. Only such persons as had an interest in the property or expected to acquire an interest in it could, as a matter of right, demand to see the records. This has been carried to the extent of refusing to title-guaranty companies the privilege of examining records of titles to land for the purpose of making abstracts thereof for use in their offices. This rule is also true as to judicial and other public records by the common law, and it still obtains in some of the United States. However, in England and in most of the United States it is provided by statute that public records may be inspected by any one, with reasonable regulations as to time and manner of examination.

A public record is good evidence of the matter to which it relates, and most jurisdictions provide that copies of a record, duly authenticated by the official custodian, shall be received in evidence with the same force and effect as the originals. This saves the public inconvenience of having records in daily use transported to the courts during a trial. The printed statutes of a State are deemed to be official, and must be accepted as such by the public and the courts. See Conveyance; Judgment; Lien; Mechanic's Lien; Recording of Deeds; Record, Judicial.

Bibliography. Cooper, *An Account of the Most Important Public Records of Great Britain* (London, 1832); F. S. Thomas, *Official Handbook to the Public Records* (ib., 1853); J. Reeves, *History of the English Law* (new ed. by W. F. Finlayson, 3 vols., ib., 1869); A. C. Ewald, *Our Public Records: A Brief Handbook* (ib., 1873); James Kent, *Commentary on American Law* (14th ed., 4 vols., Boston, 1896); Sir William Blackstone, *Commentaries* (4th ed., 2 vols., Chicago, 1899); S. R. Scargill-Bird, *A Guide to the Various Classes of Documents Preserved in the Public Record Office* (3d ed., London, 1908); G. F. Kunz, *The Imperishable Records of the Ancients* (New York, 1911).

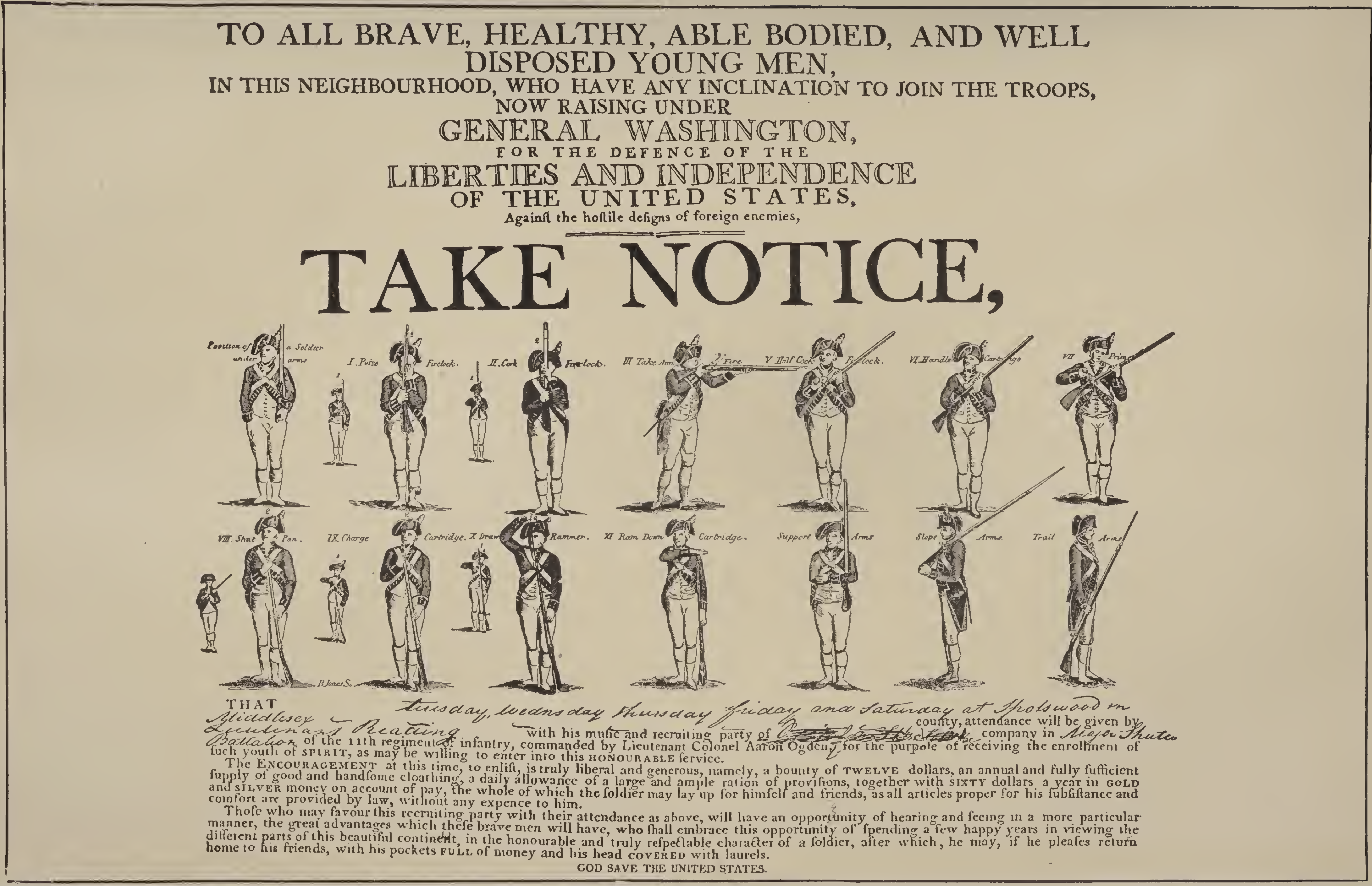
RECOUPMENT, rē̇-ko͞op′ment (OF., Fr. *recoupement*, from *recouper*, to recoup, cut off or again, from *re-*, back again, anew + *couper*, to cut, from *coup*, cut, from Lat. *colpa*, from Gk. κόλαφος, *kolaphos*, blow with the fist, from κολάπτειν, *kolaptein*, to strike). The right of a defendant in an action at law to reduce the amount of the plaintiff's recovery by the amount of any damage which he has suffered by the act or omission of the plaintiff growing out of the contract or other transaction sued upon. The term originally signified a mere reduction of the amount of the recovery because of partial payment or former recovery, but in modern practice it denotes any affirmative claim for damages growing out of the cause of action brought which the defendant asserts as a defense for the purpose only of reducing the amount of the plaintiff's recovery, although he might at his option assert the claim in an independent action. Thus, in an action upon contract for the purchase price of goods the defendant may recoup damages which he has suffered because of the plaintiff's breach of a collateral warranty of the quality of the goods, or in an action by a common carrier to recover freight money the defendant may recoup for loss or injury to the goods resulting from a violation of the plaintiff's obligation as a common carrier. In an action upon contract damages recouped may be for tort, or vice versa provided the recoupment grows out of the transaction sued upon.

Recoupment is a common-law doctrine and has become established in the several States of the United States by judicial decision. The exact limits of the application of the doctrine vary considerably in the different States. In many States, particularly those having codes of civil procedure, there are statutory forms of counterclaim which include both recoupment and set-off. See Counterclaim; Set-Off.

RECOVERY. See Common Recovery.

REC′REA′TION PIERS. In several American cities, wharves reserved for the use of the public and designed to supplement the park system of the city as breathing places for the inhabitants of the congested districts. For New York City recreation piers were first authorized by legislative act of 1892, the first pier being opened in 1896. The piers are fireproof structures, and entertainments such as music and dancing are provided at public charge.

RECRUIT′ING OFFICER, The. A comedy


Position of a Soldier under arms
I. Poise Firelock.
II. Cock Firelock.
III. Take Aim
Fire
V. Half Cock Firelock.
VI. Handle Cartridge
VII Prime
VIII. Shut Pan.
IX. Charge Cartridge.
X Draw Rammer.
XI Ram Down Cartridge.
Support Arms
Slope Arms.
Trail Arms
B. Jones S.

TO ALL BRAVE, HEALTHY, ABLE BODIED, AND WELL DISPOSED YOUNG MEN,

IN THIS NEIGHBOURHOOD, WHO HAVE ANY INCLINATION TO JOIN THE TROOPS,
NOW RAISING UNDER
GENERAL WASHINGTON,
FOR THE DEFENCE OF THE
LIBERTIES AND INDEPENDENCE
OF THE UNITED STATES,
Againſt the hoſtile deſigns of foreign enemies,

TAKE NOTICE,

THAT tuesday, wednsday thursday friday and saturday at Spolswood in Middlesex county, attendance will be given by Lieutenant Reading with his muſic and recruiting party of [illegible] company in Major Shutes Battalion of the 11th regiment of infantry, commanded by Lieutenant Colonel Aaron Ogden, for the purpoſe of receiving the enrollment of ſuch youth of SPIRIT, as may be willing to enter into this HONOURABLE ſervice.

The ENCOURAGEMENT at this time, to enliſt, is truly liberal and generous, namely, a bounty of TWELVE dollars, an annual and fully ſufficient ſupply of good and handſome cloathing, a daily allowance of a large and ample ration of proviſions, together with SIXTY dollars a year in GOLD and SILVER money on account of pay, the whole of which the ſoldier may lay up for himſelf and friends, as all articles proper for his ſubſiſtance and comfort are provided by law, without any expence to him.

Thoſe who may favour this recruiting party with their attendance as above, will have an opportunity of hearing and ſeeing in a more particular manner, the great advantages which theſe brave men will have, who ſhall embrace this opportunity of ſpending a few happy years in viewing the different parts of this beautiful continent, in the honourable and truly reſpectable character of a ſoldier, after which, he may, if he pleaſes return home to his friends, with his pockets FULL of money and his head COVERED with laurels.

GOD SAVE THE UNITED STATES.

FACSIMILE OF RECRUITING NOTICE USED IN THE REVOLUTIONARY WAR

by George Farquhar, produced in 1706. The military scenes are sketches from life, drawn from Farquhar's experience in the army.

RECRUIT'MENT (Fr. *recrutement*, from OF. *recruter*, Portug. *recrutar*, *reclutar*, from ML. *reclutare*, to recruit, patch, mend, from Lat. *re-*, back again, anew + AS. *clūt*, from Welsh *clwt*, Ir., Gael. *clud*, Manx *clooid*, clout, patch), MILITARY. The raising of men for military service. Recruitment of armies is by voluntary enlistment (the method adopted by the United States and Great Britain) or by conscription, or compulsory enlistment (the system in use on the continent of Europe). The voluntary system used by the United States in the Civil War of 1861–65 (see CONSCRIPTION) and the same system used by Great Britain in the Great War of 1914 proved unsatisfactory and inadequate in those two great wars. The recruiting system of Germany is the model for nations adopting compulsory service, and proved most effective in the War of 1914, leading to rapid and efficient mobilization. The country is divided geographically into as many corps districts as there are army corps (the latter are more or less permanently located), and these are subdivided into division, brigade, regimental, battalion, and company districts. Each company is recruited in its own geographical district. Each brigade district has also from two to six Landwehr (the reserve of the active army on the war footing) districts, which are the units of recruitment for this body. The recruits are examined by a commission of civil and military officers. Those physically, mentally, or morally unfit are rejected; the rest draw lots, the lower numbers being taken to fill the annual contingent, the higher passing to the Ersatz Reserve (a reserve of recruitment). Normally the young men are not called out till they are 20 years of age nor after they are 40. Between 17 and 20 and over 40 they belong to the Landsturm, the last reserve of the Empire. After completing his term of service in the ranks the soldier passes into the reserve of the active army, retaining his place in his regiment, borne on its books, and liable to recall till about 26 years old; he then passes to the Landwehr battalion of the district, the Landwehr command keeping the register of names and addresses. The special method of recruitment for an army in the field, now adopted by all nations except the United States, whatever the general system of recruitment may be, is by so-called depot battalions, etc., which remain in the home country and receive and train all the recruits for a particular regiment, etc. The methods for recruitment used in the United States will be found discussed under ENLISTMENT, where information as to the qualifications of recruits is given. The accompanying illustration shows a circular used in the American Revolution to obtain recruits. See ARMIES, and the paragraph *Army* in articles on the various countries; ARMY ORGANIZATION; DEPOT; ENLISTMENT; OATH; ETC.

REC'TANGLE (OF., Fr. *rectangle*, from Lat. *rectiangulum*, right-angled, from *rectus*, right, straight + *angulus*, angle). A parallelogram having four right angles. See MENSURATION; PARALLELOGRAM.

REC'TIFI'ER. A device for obtaining direct or continuous electric currents from a source of alternating-current supply. The mercury-arc rectifier consists of a vacuum tube containing a small quantity of mercury forming one of the terminals. Its operation is based on the fact that a vacuum tube containing mercury vapor under low pressure requires a much higher voltage applied to send a current through the tube in one direction than in the other, provided current has been established by tilting the tube so as to form an arc between the mercury and the other terminal. It is used for charging storage batteries and for supplying certain types of arc lamps where only alternating electric current is available. Its efficiency is about 78 per cent, improving as applied voltage increases, since the arc itself has a constant counter E. M. F. of from 14 to 15 volts and very little heat has to be dissipated in the tube. At high voltages the losses are in the transformer and reactance coils. Mercury-arc rectifiers have been built for voltages as high as 6000 and large enough to furnish a current of 40 amperes.

Kenotron rectifiers consist of a bulb or tube exhausted to a high degree of vacuum and containing as the cathode an incandescent filament, heated by an independent circuit, and as the anode a surface of considerably greater area, usually of molybdenum. When such a device is attached to an alternating-current supply, it allows electricity to pass in one direction only. Kenotrons have been made to supply current voltages up to 180,000, and the maximum amount of current rectified is as high as 2.5 amperes. It is preferable to make the device in units of about 10 kilowatts capacity when used to supply more than 25,000 volts. Actual energy losses are not more than 2 per cent of the total energy rectified. This device can replace the large static machines commonly used for Röntgen ray work; and as several may be placed in parallel, it is considered to be entirely feasible to transmit 1000 kilowatts at 50,000 volts by means of 100 kenotrons working in parallel.

Electrolytic rectifiers using electrodes of aluminium and steel in a solution of ammonium phosphate, when connected to a source of alternating current, allow a current to pass in one direction only. As they develop much heat and have other losses, they are used only for the rectification of small currents. Consult: *General Electric Review* (Schenectady, N. Y., January, March, and May, 1915). See ELECTRIC ARC; DYNAMO-ELECTRIC MACHINERY; ELECTRICITY; WIRELESS TELEGRAPHY.

REC'TIFYING. See DISTILLED LIQUORS.

REC'TOR (Lat., ruler, director). An ecclesiastical and academic title, meaning in the former sense a clergyman who has the charge of a parish and full possession of all the consequent rights and privileges. In the Church of England a rector differs from a vicar in that the latter is entitled to only a certain portion of the ecclesiastical income specially set apart to the vicarage. The office of rector as developed in England was carried over to the American Colonies, where, however, a unique development came about. Under the American civil church law (q.v.) the parishes of the Protestant Episcopal church, like the religious societies of other denominations, received civil incorporation, and the American rector, instead of continuing to be regarded, like the English, as a corporation sole, became ex officio the president of a corporation constituted of the rector, wardens, and vestrymen. To the rector belong the possession and use of the temporalities of the parish, but only for the service of the church. In the Roman Catholic church the title of rector is frequently given to a parish priest or to the superior of a college or a religious house, more especially the superior of a Jesuit seminary or college. A missionary rector in this church is a priest appointed by the bishop to certain parishes in England, and in the United States to the charge of any parish. Some few are known as irremovable rectors; these cannot be transferred to other parishes or removed for any other cause than proved misconduct.

In academic usage the title of rector is given in many places to the head of a college or of a university, as at Louvain. In this sense it was employed by the Colonial institutions of America until the middle of the eighteenth century; e.g., the head of Yale College was called rector.

REC'TUM (abbrev. of Lat. *rectum intestinum*, straight intestine). The lowest (or, in animals, the most posterior) part of the large intestine. Some anatomists include the sigmoid flexure of the large gut as a part of the rectum. In this view the first part of the rectum consists of a loop beginning in the left iliac fossa and ending opposite the third piece of the sacrum. When unfolded this loop resembles the Greek capital letter omega, and is about 17½ inches in length. It lies wholly within the pelvis, and is attached by a mesocolon to the abdominal and pelvic wall. The remaining part of the rectum extends from the middle of the third piece of the sacrum to the anus. The term "rectum" should be limited to this portion, free of mesocolon, lying in the hollow of the sacrum to the tip of the coccyx, thence curving backward and downward to the anal orifice. The portion that lies against the sacrum is about 3½ inches long, the remaining part about 1½ inches long. The upper part of the rectum proper is covered with the peritoneum, which ceases at a point 5 inches above the anus. The structure of the rectum is considered under INTESTINE (q.v.).

RECTUM, DISEASES OF THE. The rectum is the seat of a number of congenital deformities. Imperforate anus, or entire absence of the anus, is sometimes found in newly born children. Occasionally the rectum opens into the vagina or urethra. These conditions have to be met with prompt surgical measures. An imperforate anus is punctured or incised and kept open by bougies until healing takes place, and a preternaturally narrowed rectum or anus is dilated with rectal sounds or with the finger. Sometimes an artificial anus has to be made, either at the natural site or farther up in the inguinal region. In feeble or ill-nourished children prolapse of the rectum or anus is apt to occur from diarrhœa and excessive straining at stool, or in connection with worms, stone in the bladder, or other irritation. Prolapse is reduced by the application of cold compresses and gentle replacement of the protruding tissue with the fingers. It is then retained by a pad, and recurrence is combated by the use of astringent and antiseptic injections. A perfect cure, however, is to be secured only by the removal of the causative condition.

Adults are subject to numerous disorders of the rectum. Inflammation (proctitis) results from constipation and from chronic diarrhœa and dysentery. Infection may extend through the rectal walls into the surrounding loose tissue and set up periproctitis, or the more serious ischiorectal abscess. Ulceration of the rectum may be caused by abrasions from hardened fæcal masses, by syphilis, or by tuberculosis; it may be single or multiple. Ulcers are treated locally by cleansing and astringent injections, with constitutional remedies adapted to the individual case. Spasm of the rectum (proctospasm) or sphincter ani is a not uncommon manifestation of neurasthenia and hysteria, but its most usual causes are anal fissure and hemorrhoids. Stricture, which may result in complete occlusion, may be simple or malignant. The simple form is caused by contraction of scar tissue arising from ulcerations, syphilitic, dysenteric, or postoperative. When due to cancer the pain is intense and lancinating and the patient becomes emaciated. The stools are often flattened out like ribbons, and contain blood and mucus. Stricture of the rectum is best treated by laxatives, cleansing injections, and by gradual dilation with soft rubber bougies. In the case of cancer, however, these measures are only palliative. Here it is often necessary to remove a part or all of the rectum and stitch the colon to the edges of an artificial opening in the abdominal wall at the groin, thus forming a new anus. Patients can thus live in comparative comfort.

Fissure of the anus is a crack at the anal opening, producing spasm of the sphincter muscle. It causes violent burning pain during defecation, and the dread of this suffering results in voluntary inaction of the bowels and habitual constipation. Intense itching often accompanies fissure. Strict cleanliness and the application of healing ointments usually suffice to cure this condition. Touching with the point of a stick of lunar caustic is a valuable remedy. Fistula in ano consists of the unhealed track of an abscess adjacent to the lower part of the rectum on the verge of the anus. An abscess in this region heals with great difficulty, because of the constant movement of these parts and the passage of fæces, which reinfect and irritate it. Fistula is not uncommonly associated with hemorrhoids, cancer, or stricture. These are the varieties of fistula: the blind external terminates in a cul de sac near the bowel and opens at or near the margin of the external sphincter; the blind internal fistula opens into the bowel and has no external orifice; the complete has both an internal and an external opening. The symptoms are passage of wind and fæces through the opening and of a discharge which stains the clothing. Repeated attacks of inflammation ensue and new abscesses form. Treatment in all varieties of fistula is free incision and cutting out of the fistulous tract. See FISTULA.

Hemorrhoids or piles are venous tumors situated either within, without, or on the margin of the anus and are caused by congestions and inflammation of the abundant vascular areas of the rectum. (See PILES.) Polypus of the rectum is a tumor attached by a narrow pedicle and originating in a relaxed fold of the mucous membrane, or in granulation tissue springing from an ulcer, or in a mass of hemorrhoids. The only remedy is removal.

Pruritus of the anus is a symptom of many diseases, both local and distant. It may and often does accompany such widely diverse affections as piles, fissure, seat worms, eczema, nerve disturbances, Bright's disease, jaundice, constipation. The itching is almost unbearable and is worse at night. The general treatment will depend on the exciting cause. Locally sedative lotions and ointments are employed and strict cleanliness observed. Eczema (q.v.) often affects this region. Consult J. M. Lynch, *Diseases of the Rectum and Colon* (Philadelphia, 1914).

REC'USANT (OF. *recusant*, Fr. *récusant*, from Lat. *recusare*, to reject, from *re-*, back again, anew + *causa*, cause). In English ecclesiastical legislation, any person who refuses to attend the services of the Established church.

Laws against recusants have borne most heavily upon Roman Catholics, who in earlier times were generally suspected of plotting against the government and the person of the sovereign. The first of such laws was passed in 1562, but the culmination of such legislation was under Elizabeth in 1593. A law passed in that year read that all Popish recusants over 16 years of age must "repair to their places of dwelling where they usually heretofore made their common abode, and shall not, at any time after, pass or remove above 5 miles from thence." If they did remove, their goods were forfeited to the crown. If they had no property they were required to leave the country, upon penalty of being treated as felons. If they made public submission they were to be absolved. Consult the act in Gee and Hardy, *Documents Illustrative of English Church History*, pp. 498–508 (London, 1896). The Popish recusants still being considered a source of danger after Elizabeth's reign, additional and more stringent laws were passed against them during the reign of James (1606), Charles II (1685), William and Mary, and Anne. All such legislation was abrogated in the reign of Victoria.

RED. One of the three primary colors, the rays of which are least broken and which is, consequently, at the end of the spectrum. It is much used, as well in the fine arts as in dyeing and other applied arts. The mineral world furnishes vermilion and the red ochres; the animal, carmine, scarlet, and others; and the vegetable, the different madder pigments (qq.v.). Since 1848 the term "red," as being the color of blood, has been applied by their opponents to the radical parties, especially in France. The red flag has been adopted as the emblem of their creed by the Social Democrats the world over.

RED ADMIRAL. See Admiral; and Colored Plate of Butterflies.

RED ALGÆ. See Hydrophytes; Rhodophyceæ.

REDAN, rḗ-dăn′ (OF. *redan*, *redent*, Fr. *redan*, from Lat. *re-*, back again, anew + *dens*, tooth). A work in fortification which consists of two parapets whose faces join in forming a salient angle, usually about 60°, towards the enemy, like a letter V, in which the apex is to the front. The rear is usually open or only partially closed. The redan is mainly used to secure a flanking fire along the front of a line of parapets or a cross fire on important ground. The method of construction and dimension of the parapet are similar to those of a redoubt (q.v.). See Fortification; Siege and Siege Works.

RED ANT. See House Ant.

REDBACK. See Dunlin.

RED-BACKED MOUSE, or Wood Mouse. A small meadow mouse (*Evotomys gapperi*) of the wooded regions of Canada and the eastern United States, numerous in boggy regions. The color of the back is bright reddish chestnut, lightening below into buffy white. There is also a Northern gray variety. These mice have the general habits of meadow mice, but those of southern New Jersey inhabit exclusively the *Sphagnum* bogs, where they burrow deeply in the moss, making tunnels and nests below the frost line.

RED-BACKED SANDPIPER. A shore bird, the dunlin (qq.v.), also known to American gunners as winter snipe and blackbreast.

RED BANK. A borough in Monmouth Co., N. J., 26 miles south of New York City, with which it has steamboat connection, on the Shrewsbury River and on the Pennsylvania and the Central of New Jersey railroads (Map: New Jersey, D 3). It is a popular summer resort. There are in Red Bank Shrewsbury Academy and public and high school libraries. The leading manufactories include carriage shops, a clothing factory, boat works, a catchup factory, sash and blind factory, concrete block works, a large canning factory, boiler works, and gold-beating establishments. Pop., 1900, 5428; 1910, 7398; 1915 (State census), 8631.

RED BAT. A small North American bat (*Lasiurus borealis*), 4.4 inches long and 11 inches in expanse of wing. Its fur varies from bright rust red to gray, with a whitish patch on each side of the breast. Those of the Northern States migrate southward in winter. It was formerly called the New York bat.

RED-BELLIED SNAKE. A common harmless snake (*Storeria occipitomaculata*) of the eastern half of the United States, allied to the garter snakes, but shorter and more robust; it is also called wampum snake. It is chestnut or grayish brown; a paler line, about three scales wide, runs along the spine; the hindhead shows three pale blotches, and the abdomen is salmon red. Another small red-bellied snake in the Mississippi valley is Kirtland's (*Tropidoclonium*, or *Clonophis*, *kirtlandi*), but its head is shining black, and lines of round black spots mark its whole length. A much larger species is the red-bellied water snake (*Natrix*, or *Tropidonotus*, *erythrogaster*), which is found in the Southern States and northward to Michigan. It reaches a length of 4 feet.

REDBIRD. A local name for birds of red plumage. In the United States given to the tanagers and to the cardinal bird (qq.v.).

RED BLUFF. A city and the county seat of Tehama Co., Cal., 137 miles north of Sacramento, on the Sacramento River, affording water transportation, and on the Southern Pacific Railroad (Map: California, C 2). It is a commercial and residential place, with wheat, wool, lumber, and fruit interests. The city has the Herbert Kraft Public Library and the Academy of Our Lady of Mercy. There are flour mills, canneries, a fruit-drying plant, and a packing house. Pop., 1900, 2750; 1910, 3530.

RED BOX. See Eucalyptus.

REDBREAST. See Robin.

RED-BREASTED (or Robin) **SNIPE.** A dowitcher (q.v.).

RED BUG. A heteropterous insect (*Dysdercus suturellus*) which damages cotton and oranges in the southern United States; also called cotton stainer. (See Cotton Insects.) The term "red bug" is also applied in parts of the southern United States to the larvæ of certain harvest mites, also called jigger.

RED CEDAR RIVER. See Cedar River.

RED CHARCOAL. See Charbon Rouge.

REDCLIFFE, Viscount Stratford de. See Stratford de Redcliffe.

RED CLOUD (trans. of his native name, *Maqpeya-luta*) (c.1825–1909). A chief of the Ogalala Sioux. He rapidly rose to the first rank in his band by his bravery and success upon the warpath and wisdom in council. He was active in wars with the Crow, Blackfoot, and other tribes, and fought against the government in the war which began in 1863 and lasted almost continuously until 1868. With Sitting Bull he opposed the sale of the Black Hills in 1876, and also the agreement of 1889, by which the Sioux surrendered half of their remaining country. He supported the Messiah doctrine and the ghost dance in 1890. In his warrior days, according to his own statement, he "counted *coup*" 80 times, i.e., performed 80 separate deeds of valor against the enemy, any one of which entitled him to some distinguishing badge of honor. As a delegate for his people he made numerous visits to Washington. He was succeeded by his son Jack Red Cloud.

RED CROSS, Order of the. 1. A Russian order with two classes, established in 1878 at the close of the Turkish War. It is conferred on women only and is bestowed by the Empress. 2. An English order founded by Queen Victoria, in 1883, for women who have distinguished themselves in the care of sick soldiers. It is conferred on foreigners as well as on Englishwomen. The decoration is a golden cross inscribed with the words Faith, Hope, Charity, and bearing the date 1883.

RED CROSS KNIGHT, The. The hero of the first book of Spenser's *Faerie Queene,* typifying holiness and secondarily St. George, also the Church of England. At first an awkward clown, when armed he becomes the champion of Truth (Una) against the dragon.

RED CROSS SOCIETIES. International associations whose purpose is to mitigate the horrors of war by alleviating the sufferings of the sick and wounded. They are the result of an agitation begun by M. Jean Henri Dunant (q.v.), a philanthropic citizen of Geneva, Switzerland. On June 24, 1859, he chanced to be present at the battle of Solferino and was an eyewitness to the vast amount of unnecessary suffering that resulted from the inability of the regular surgical corps to care for the thousands of wounded who lay upon the field. Three years later he published the widely read book, *Un souvenir de Solférino,* in which he vividly described the horrors he had witnessed and proposed that societies should be formed in every country in time of peace for the purpose of training nurses and collecting supplies, so that if war should break out the work of the regular military surgical corps could be supplemented. M. Dunant's proposal was well received by the Genevan Society of Public Utility, and an agitation was begun which resulted in an international conference at Geneva in October, 1863. A provisional programme was agreed upon by the delegates of the 16 nations that were represented, and in the following August a more formal diplomatic congress, composed of representatives from the same number of nations, was held in the same city. On the twenty-second of that month was signed what is known as the Geneva Convention (q.v.). Contrary to generally received opinion the convention makes no direct provision for the organization of Red Cross societies, but it renders such societies possible; and at the previous conference it had been stipulated that each nation that should ratify the convention should have one national committee or society, civil in its character and functions, which should alone have the right to authorize the sending of surgical corps to a war. The convention was quickly ratified by 14 nations, a number that has now been increased to 43, and thus its provisions have come to be a recognized part of international law. During the Servian War of 1876 the Turkish government notified the signatory powers that it had adopted the crescent instead of the red cross as the badge of its societies.

The American Red Cross Society was formed in 1881 under the leadership of Clara Barton (q.v.), who acted as its first president. Congress, recognizing the important relations between the Red Cross and the army and navy in time of war, and the importance of a thoroughly national society, by special Act, approved Jan. 5, 1905, dissolved the society then existing and incorporated a new organization to be operated under government supervision. The accounts of the new organization are audited annually by the War Department. This Act provides also that the governing body shall be a central committee of 18 members, 6 of whom shall be appointed by the President of the United States. The American Red Cross has expended about $10,000,000 in relief since its reorganization in 1905.

A few of the larger items of this amount are—1906: Japanese famine, $245,855.67; San Francisco earthquake and fire, $3,087,469.44; 1907: Chinese famine, $325,725.43; 1908: Italian earthquake, $985,300.21; 1909: Cherry Mine disaster, $97,247.11; Turkish-Armenian relief, $30,500; 1910: Paris flood, $44,942.03; Chinese famine, $251,677.55; Minnesota forest fires, $95,114.24; Taal volcano (Philippines), $16,050; Washington Place factory fire (New York City), $70,000; 1912: Balkan War, $75,631.60; *Titanic* wreck, $125,993.75; Mississippi floods, $27,486.24; 1913: Mexican insurrection, $20,451.79; Mississippi River floods, $20,000; Ohio and interior storm and flood, $2,472,287.61; 1914: second Balkan War (Bulgaria), $18,000; Ohio and interior flood, $23,465.56; Chinese River conservancy work, $75,000; 1915: European War relief (expended and obligated for), $1,400,000.

It was soon found that the convention of 1864 was in certain respects inadequate and that some revision was desirable. In 1867 the first International Red Cross Conference, held at Paris, proposed such a revision, and in the following year a diplomatic congress convened at Geneva to consider the matter. This congress agreed to add a few supplementary clauses, one of which provided that the principles of the convention should be applied to naval warfare. Owing to the Franco-Prussian War and to other causes, however, the clauses were not ratified by the Powers and consequently had no binding force as international law. It was not, in fact, until The Hague Peace Conference of 1899 that it was agreed to apply the principles of the convention to war upon the seas. At other international conferences of the Red Cross societies—at Berlin in 1869, Geneva in 1884, Karlsruhe in 1887, Rome in 1892, Vienna in 1897, St. Petersburg in 1902, London in 1907, and Washington, D. C., in 1912—other subjects for amplification were discussed. Among these were the relations of the Red Cross to the army, the means that should be taken to impress upon the soldiers the necessity of respecting the red cross, and the measures that would best prevent the abuse of the emblem by persons who might make use of it to cloak hostile or unworthy designs. An international conference was held at Geneva in 1906 for the revision of the Treaty of Geneva, the revised treaty to be submitted to Congress for ratification.

The various national Red Cross associations are not intimately connected, but the International Committee at Geneva is regarded as the central committee of all. Through it all international communications are made, and by it an international bulletin is published. The president of the Geneva committee is Gustave Ador.

In 1915 the officers of the American National Red Cross were: Hon. Woodrow Wilson, president; Maj. Gen. George W. Davis, U.S.A., retired, chairman central committee; Ernest P. Bicknell, national director; Charles L. Magee, national secretary.

Bibliography. Gustave Moynier, *Etude sur la convention de Genève* (Paris, 1870); C. Lueder, *Die Genfer Convention* (Erlangen, 1876); id., *La convention de Genève au point de vue historique, critique, et dogmatique* (ib., 1877); Gustave Moynier, *La Croix-Rouge, son passé et son avenir* (Paris, 1882); Friedrich Criegern, *Das rothe Kreuz in Deutschland* (Leipzig, 1883); Maxime Du Camp, *La Croix-Rouge de France* (Paris, 1889); Clara Barton, *The Red Cross* (Washington, 1898); Haje and Simon, *Les Origines de la Croix-Rouge* (Paris, 1900); Ludwig Ernst Visser, *La convention de Genève . . . et les sociétés de la Croix-Rouge* (ib., 1902); Clara Barton, *Story of the Red Cross* (New York, 1904); J. H. Dunant, *Origin of the Red Cross* (Philadelphia, 1911); Mary Frances Billington, *The Red Cross in War* (New York, 1914); Vivian and Williams, *The Way of the Red Cross* (ib., 1915); *Bulletin international des sociétés de la Croix-Rouge*, published four times a year by the International Committee of Geneva; *Memorial des vingt-cinq premières années de la Croix-Rouge, 1863–1888*, published by the same committee; *American National Red Cross Relief Committee Reports* (New York, 1898; 2d ed., 1899).

RED DEER. A town and the capital of Red Deer electoral district, Alberta, Canada, on Red Deer River, a divisional point on the Canadian Pacific and Canadian Northern railways, 110 miles by rail south of Edmonton (Map: Alberta, G 6). It possesses a Presbyterian Ladies College, Roman Catholic Convent, two opera houses, and a Dominion Lands Office. Its industrial establishments include ironworks, a brick and tile plant, a saw mill, stone quarry, creamery, and manufactories of concrete blocks, mattresses, homogenized milk, etc. Red Deer is governed by a commission. Pop., 1901, 323; 1911, 2118.

RED DEER. The common deer of Europe, the males of which are the stags hunted in Scotland and elsewhere. See DEER; STILL-HUNTING.

RED′DING. A city and the county seat of Shasta Co., Cal., 170 miles north of Sacramento, on the Sacramento River and on the Southern Pacific Railroad (Map: California, C 2). The courthouse, Carnegie library, and sanatorium are noteworthy. Redding is situated in a gold and copper mining and lumbering region, has five large copper smelters near by, and manufactures lumber, foundry and machine-shop products, etc. Pop., 1900, 2946; 1910, 3572.

RED′DITCH. A town in Worcestershire, England, on the Arrow, 13 miles southwest of Birmingham (Map: England, E 4). It is the centre of the needle-manufacturing industry, and pins, fishhooks, fishing tackle, and automobiles also are largely made. Pop., 1901, 13,493; 1911, 15,463.

REDEEM′ER, ORDER OF THE. A Greek order founded in 1829 and reorganized by King Otto in 1833. Its membership consists of persons distinguished in the War of Liberation and in commerce, industry, science, or art. The decoration is a white cross on a green wreath of oak and laurel; on the medallion is an image of the Saviour. The reverse bears the Greek cross. See Plate of ORDERS.

REDEMP′TION (Lat. *redemptio*, from *redimere*, to buy back, redeem, from *red-*, *re-*, back again, anew + *emere*, to buy). In English and American law, the determination of a creditor's right in property, real or personal, by the discharge of the obligation for which the property is held. Strictly speaking, the term refers to the right which equity confers on a debtor who has made default in paying the amount of his debt when due, to recover his pledged or mortgaged property by a subsequent payment. The right of the creditor having become absolute at law through the debtor's default, equity required a reconveyance of the property to the latter on such subsequent performance. This is no longer necessary, the payment or sufficient tender thereof having the effect of revesting the title or right of immediate possession ipso facto in the debtor. See CONDITION; EQUITY OF REDEMPTION; FORECLOSURE; PLEDGE; ETC.

REDEMPTIONISTS. See TRINITARIANS.

REDEMP′TORISTS (Fr. *rédemptoriste*, from Lat. *redemptor*, redeemer, from *redimere*, to buy back, redeem), also called LIGUORIANS. A congregation of missionary priests founded in 1732 by St. Alphonsus Liguori (q.v.). The members of the Congregation of the Most Holy Redeemer were bound to seek their own perfection by the obligations and rules of a religious life and to devote themselves to apostolic work among the most neglected and forsaken souls, especially in country places. The instructions given by the members are of the simplest and plainest character. The congregation was originally founded in Naples, but, being approved by Benedict XIV in 1749, spread rapidly throughout Italy and afterward extended into Germany and Switzerland. The suppression of the Jesuits in 1773 left a hiatus in missionary fields which the Redemptorists were called upon to fill. By the end of the eighteenth century the congregation had spread throughout most of the countries of Europe, and in the early part of the nineteenth century houses were established in North and South America and in Australia.

St. Alphonsus founded also an order of nuns called Redemptoristines. This is a strictly contemplative order with a number of convents in Italy, three in Austria, four in Belgium, three in Holland, two in France, and one in Ireland. For their constitution and early history, see Dumortier, *Les premières Rédemptoristines* (Lille, 1884).

The Redemptorists are noted for their faculty of doing effective missionary work among the uncultured classes of the population. Their missionary system includes frequent "renovations" in order effectively to secure the good already done, and the frequent reception of the sacraments is recommended for the perpetuation of the fruit of the missions. In 1910 there were 19 provinces and 10 vice provinces of the congregation. Altogether there were, in 1910, 218 houses, with 3300 members, of whom 1620 were priests, 489 clerical students, 150 choir novices, 733 professed lay brothers, and 300 lay novices. In the United States there were, in 1914, 2 colleges, 2 novitiates, and 41 convents; priests 367, professed students 105, novices 34, lay brothers 121, and 326 students in preparatory colleges. Consult, for the history of the order in America: Joseph Wuest, *Annales Provinciæ Americanæ* (Ilchester, Md., 1888); O. V. R. Phillips, *Life of Father Hofbauer* (New York, 1893); C. W. Currier, *History of Religious Orders* (ib., 1894); Berthe, *Saint Alphonse de Liguori* (2 vols., Paris, 1900; Eng. trans., St. Louis, 1906); *New Mission Book of the Congregation of the Most Holy Redeemer* (ib., 1911).

REDESDALE, rēdz′dāl, JOHN FREEMAN-MITFORD, first BARON (1748–1830). An English barrister and politician, born in London. He became a barrister at the Inner Temple in 1777, was elected a member of Parliament in 1788, was appointed a Welsh judge in 1789, became Solicitor-General and was knighted in 1793, and six years later was made Attorney-General. In 1801 he was chosen Speaker of the House of Commons and appointed a Privy Councilor, and in the following year was made Lord Chancellor of Ireland and created Baron Redesdale. Dismissed from the chancellorship in 1806, he was thereafter an active member of the House of Lords. He published, with the aid of Samuel Tyler, *Pleadings and Practice in Equity*, a standard authority; also *A Political View of the Roman Catholic Question* (1829).

RED′FIELD. A city and the county seat of Spink Co., S. Dak., 40 miles south of Aberdeen, on the Chicago and Northwestern and the Chicago, Milwaukee, and St. Paul railroads (Map: South Dakota, F 3). It is the seat of Redfield College (Congregational), opened in 1887, and of the Northern Hospital for the Feeble-Minded, a State institution, and contains a Carnegie library. Pop., 1900, 1015; 1910, 3060.

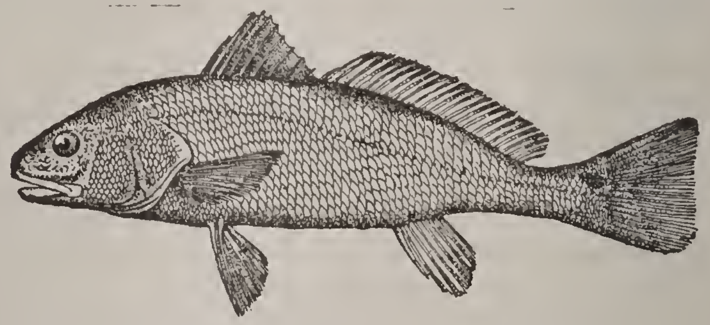
REDFIELD, EDWARD WILLIS (1868–). An American landscape painter. He was born at Bridgeville, Del., and studied at the Pennsylvania Academy and under Bouguereau and Fleury in Paris. A Realist, rendering nature with fidelity and virility, he became a leader in the modern American movement in landscape. His work, at first somewhat hard and dry, became increasingly individual and his color richer and more vibrant. His favorite subjects were winter scenes in the Delaware valley country, where he made his home. He is represented in the Luxembourg (Paris), Corcoran Gallery (Washington), Boston Museum, Pennsylvania Academy, Brooklyn Institute, and other galleries. Redfield became a National Academician in 1904 and received many prizes and medals.

REDFIELD, WILLIAM C (1789–1857). An American meteorologist and railroad projector, born at Middletown, Conn. In 1820 he became interested in steam navigation, and, after studying the causes of numerous boiler explosions which had been alarming the public, he founded a line of safety barges towed by a steamer plying between New York and Albany. These barges were later utilized for the carriage of freight only, the line being the first of the sort. Redfield was also active in projecting the early railroads in New York and Connecticut. In science, though he devoted some attention to geology, his principal contributions were in meteorology. He sought to demonstrate that all violent gales are whirlwinds and have a rotary and progressive movement, that the direction of revolution is uniform, and that the velocity of rotation increases from the margin towards the centre. The American Association of Naturalists and Geologists he reorganized as the American Association for the Advancement of Science and was its first president in 1848. His papers appeared mostly in the *American Journal of Science.* Consult D. Olmsted, *Scientific Life and Labors of William C Redfield* (New Haven, 1857).

REDFIELD, WILLIAM COX (1858–). An American manufacturer and cabinet officer, born in Albany, N. Y. In 1885 he entered the employ of J. H. Williams and Company of Brooklyn, manufacturers of steel drop forgings. Of this firm he became president in 1905. Redfield greatly developed the plans of the founder of the firm, who had been an early exponent of scientific business management. From 1905 to 1913 he was director of the Equitable Life Assurance Society. In politics a Democrat and opponent of the protective tariff, he was defeated for Congress in 1896, but from 1902 to 1903 he served as commissioner of public works of New York under appointment of Mayor Seth Low, and in 1910 he was elected to Congress. In the House he made a national reputation by a powerful speech in advocacy of a reduced tariff. Of this speech 3,000,000 copies were distributed. After his appointment (1913) as Secretary of Commerce in President Wilson's cabinet Redfield worked for the expansion of American shipping, advocated the Ship Purchase Bill, and sought to increase safety at sea. He was the author of numerous articles on commerce, industrial combinations, and foreign trade, and of *The New Industrial Day* (1912).

RED′FIN′. The name given to two or three dace or minnows which have notably red fins and especially to the common shiner (*Notropis cornutus*), found in almost every small stream east of the Rocky Mountains and north of Georgia. It exhibits many local varieties of form and color, some never exceeding 4 inches, while others reach 8 inches in length. It may be distinguished from other shiners by its large size, steel-blue back, with a gilt line along the spine and another along each side, and the rosy tint of the lower fins. Cf. SHINER; and see Plate of DACE AND MINNOWS.

RED′FISH′. 1. The red drum or channel bass (*Sciænops ocellatus*). It is a rich iridescent gray in color, often washed with coppery red, and reaches a length of 5 feet and a weight of 75 pounds, but is usually much smaller. It is to be found along the whole southern coast of the United States, is everywhere valuable as a food fish, and on the Texas coast is said to exceed in economic importance all other fishes found there. 2. In southern California, a large and handsome fish (*Pimelometopon pulcher*) related to the doncellas. The body is somewhat deep and compressed, and the blunt forehead in the adult carries a very prominent fatty hump, whence the fish is frequently called fathead. In the males the head, dorsal, anal, and caudal fins are purplish black, and the rest of the body varies from clear



REDFISH OR CHANNEL BASS.

crimson to blackish purple. The females are dusky rose color. This handsome fish, which reaches a length of 3 feet and a weight of 13 to 15 pounds, is caught abundantly with hook and line in the kelp beds along the shore and is a favorite with the Chinese, who salt and dry its flesh. 3. One of the most important and richly colored of the Californian rosefishes (*Sebastes marinus*). (See ROSEFISH.) 4. The Alaskan name for the red or blue-back salmon (*Oncorhynchus nerka*). It is known in two forms, one large and one small. See SALMON.

RED GAME, or GROUSE. The common moor fowl or ptarmigan (*Lagopus scoticus*) in its summer dress. See GROUSE; PTARMIGAN.

RED'GAUNT'LET. A novel by Sir Walter Scott (1824). The hero, Sir Arthur Redgauntlet, is brought up as Darsie Latimer.

RED'GRAVE, RICHARD (1804–88). An English genre and landscape painter and author, born in London. He was admitted to the schools of the Royal Academy in 1826 and first achieved success in 1844 with the "Seamstress." In 1851 he was made Royal Academician. He was head master of the government school of design in 1848 and art superintendent in 1852. In 1857 he was made inspector general of art schools at South Kensington and surveyor of crown pictures, holding the latter position until 1880. Ten of his paintings are in the South Kensington Museum, including "Gulliver on the Farmer's Table" (1837), "Ophelia" and "Cinderella." Redgrave is author of *An Elementary Manual of Colors* (1863). His brother SAMUEL (1802–76) studied architecture at the Royal Academy in 1833, but is best known as a manager of a number of important art exhibitions and especially as an author on art topics. He published *A Century of Painters of the English School* (1866), with his brother Richard, and a *Dictionary of Artists of the British School* (1874). These, like the *Memoir* made from the *Diary of Richard Redgrave* by F. M. Redgrave (London, 1891), are valuable and interesting.

RED GUM. See MILIARIA.

RED GUM. See EUCALYPTUS.

REDHEAD. A numerous and widespread American duck (*Aythya*, or *Marila, americana*), closely allied to the canvasback, but differing from it in having the head chestnut red and in other particulars given under CANVASBACK (q.v.); also in the shorter bill, as illustrated herewith. They appear in great numbers in spring and autumn, especially about fresh-water marshes, assembling in large migratory flocks and keeping close together; they are strong, hardy birds and swift fliers. Early in March they hasten northward to breeding places in Canada. Consult: D. G. Elliot, *Wildfowl of the United States and British Possessions* (New York, 1898); H. K. Job, *Among the Waterfowl* (ib., 1902); and books relating to shooting.

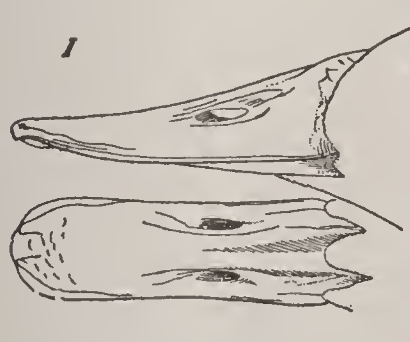


FIG. 1.
BEAK OF CANVASBACK.

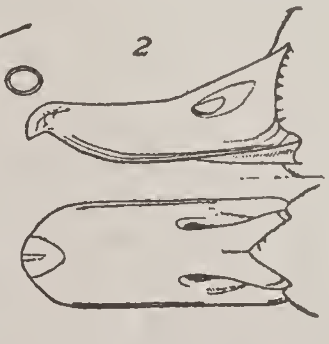


FIG. 2.
BEAK OF REDHEAD.

RED-HEADED LINNET. See HOUSE FINCH.

RED'HOUSE, SIR JAMES WILLIAM (1811–92). An English Orientalist and diplomat, born near London and educated at Christ's Hospital (1819–26). He was early employed by the Turkish government as a draftsman and in 1838, after various travels, became translator and confidential interpreter to the Grand Vizier. In 1854 he was appointed Oriental translator to the British Foreign Office, and in 1857 at Paris he took a prominent part in the treaty with Persia. His great work, a dictionary of Persian, Turkish, and Arabic, was left unfinished. His published works include: *Grammaire raisonnée de la langue Ottomane* (1846); *A Dictionary of Arabic and Persian Words Used in Turkish* (1853); *English-Turkish and Turkish-English Dictionary* (1856); *Lexicon of English and Turkish* (1861; 3d ed., 1884); *Diary of the Shah of Persia during his Tour through Europe in 1873* (trans. from the Persian, 1874); *History, System, and Varieties of Turkish Poetry* (1880); a version of Merlána's *Mesnerí* (1881); and a translation of Hasan al Ḱhazrají, *The Pearl-Strings: A History of the Resuliyy Dynasty of Yemen*, edited by E. G. Browne, R. A. Nicholson, and A. Rogers (4 vols., Leyden, 1906–13).

REDIN'TEGRA'TION (Lat. *redintegratio*, from *redintegrare*, to restore, from *red-*, *re-*, back again, anew + *integrare*, to make whole, from *integer*, entire, from *in-*, not + *tangere*, to touch). A term first introduced into the psychology of association (q.v.) by Hamilton, for whom it meant the reinstatement, through the suggestion of one element, of all the elements which had previously constituted an act of cognition. A tendency has, however, arisen in modern psychology to restrict the word to those cases of association in which a constituent part of an original situation associatively reinstates the total situation. James calls such cases "impartial redintegration." Whether impartial redintegration ever occurs in complete form is more than doubtful; as a functional type of the reproducing consciousness it may, however, be usefully distinguished from "mixed" association and "focal" association. Consult: Sir William Hamilton, *Lectures on Metaphysics*, vol. ii (2d ed., London, 1861); Thomas Reid, *Works*, vol. ii, edited by Sir William Hamilton (6th ed., ib., 1863); S. H. Hodgson, *Metaphysics of Experience* (4 vols., ib., 1898); William James, *Principles of Psychology* (2 vols., New York, 1905).

REDIS'COUNTING. Rediscounting is a term used in commercial banking to define the practice of granting credit upon notes, drafts, and other forms of commercial paper which have already been discounted for the maker or first holder. As discount of a promissory note or bill is practically a purchase by the banker who takes it for discount (subject to certain rights of recourse), so rediscount is merely the passing of it along to another purchaser. In banking practice rediscount is usually granted by a banker to another banker or to an accepting house. The note or bill, in passing through the hands of the banker making the original discount, acquires his indorsement and thereby binds him to make good the amount due on the instrument in case of default by the maker or drawee. The practice of rediscount is closely linked with that of acceptance. Acceptance involves the promise of a party on whom a bill of exchange or draft is drawn, or of some one properly designated by him, that he will pay it at its due date. Such acceptance is usually indicated by the signature or the name of the acceptor across the face of the document. Acceptance under American practice was defined by the Federal Reserve Board of the United States on Feb. 8, 1915, as follows:

"In this regulation the term 'acceptance' is defined as a draft or bill of exchange drawn to order, having a definite maturity and payable in dollars, in the United States, the obligation to pay which has been accepted by an acknowledgment written across the face of the instrument by the party on whom it is drawn; such agreement to be to the effect that the acceptor will pay at maturity according to the tenor of such draft or bill without qualifying conditions."

In European banking practice "accepted" bills constitute the bulk of the paper which is rediscounted. When another party is designated as acceptor for the mercantile maker of a bill, it is known as a "domiciled bill." It is usually a banker or an accepting house of established resources and reputation, which by acceptance assumes the obligation to pay a domiciled bill at maturity which rested originally upon the maker only. Thus, a bill which has been accepted and rediscounted acquires a number of strong indorsements, which make it one of the best forms of temporary investment. As such, it is eagerly sought by bankers as almost the equivalent of cash, because the strength and reputation of the indorsers insure its soundness; its early maturity insures its prompt convertibility; and it has the advantage over cash of affording an income.

The function of rediscounting accepted paper has become, under the modern organization of banking, the distinctive function of the central bank of issue, to the partial exclusion of direct discounting, which is the function of joint-stock and private bankers. It was estimated by the governor of the Bank of France in 1908 that the proportion of paper passing through the bank which bore another banking indorsement was about 70 per cent of the whole; a similar estimate made by the officials of the Imperial Bank of Germany put the proportion for that institution at 60 per cent. In Europe the central banks continue to grant direct discounts to clients whose paper has not passed through other banks; but in the United States, under the Federal Reserve Act of Dec. 23, 1913, discounting is permitted to the regional banks only for paper offered for discount by "a member bank."

The effect of the system of rediscount and acceptance is to give to the banking system much greater flexibility and security than without it, since it affords to a joint-stock or private bank, if its cash resources are reduced, the privilege of obtaining currency or credit by presenting a part of its assets to the central bank for rediscount. First-class bankers' acceptances are often purchased as investments by private bankers and even by the central banks and are considered as so quickly convertible into cash as to constitute a secondary reserve auxiliary to the gold stock. When rediscounted paper bears the acceptance of a strong foreign bank or accepting house, it can be sold in the open market to meet liabilities abroad in lieu of the export of gold. Foreign bills have been largely held in recent years for this purpose by the Imperial Bank of Germany, the Bank of Austria-Hungary, and the National Bank of Belgium.

For an account of how the rediscount system temporarily broke down at the outbreak of the European War in 1914, but how it was ultimately utilized, see PANIC.

RED JACKET. A village in Houghton Co., Mich., in the township of Calumet (q.v.).

RED JACKET (*Sa-go-ye-wat-ha*, he keeps them awake) (c.1750–1830). A celebrated chief of the Seneca Indians. He received his English name in reference to the great pride he took in a scarlet jacket given to him shortly after the Revolution by an English officer. During the Revolution he fought on the side of the English and in 1784 bitterly opposed the Treaty of Fort Stanwix, by which the Iroquois ceded some of their land to the United States. Though originally without rank in his tribe, he soon, through his eloquence in council, became one of the principal chiefs. In 1810 he gave the United States government some valuable information concerning the schemes of Tecumseh and during the war on the frontier (1811–14) assisted the United States troops. Subsequently he became a confirmed drunkard and for this and other reasons was deposed by a council of chiefs in 1827, but was soon restored to his old rank. He was never prominent as a warrior and seems to have been a coward, but as an orator he was unrivaled and in council had the greatest influence. By many he has been considered the most eloquent speaker the Indian race ever produced. Though at first in favor of the education of his people, he subsequently changed his mind and became the bitterest opponent of schools and Christianity. He has been called "the last of the Senecas," having been the last of that tribe's great chiefs. Consult W. L. Stone, *Life and Times of Sa-go-ye-wat-ha, or Red Jacket* (Albany, 1866), and J. N. Hubbard, *An Account of Sa-go-ye-wat-ha, or Red Jacket, and his People, 1750–1830* (ib., 1886).

RED′LANDS. A city in San Bernardino Co., Cal., 68 miles by rail east of Los Angeles, on the Santa Fe and the Southern Pacific railroads (Map: California, H 8). It lies in the San Bernardino foothills in one of the most beautiful regions of the State. The city is the seat of the University of Redlands and has an excellent system of public schools, the A. K. Smiley Public Library, several clubs, and 10 parks. Located in one of the greatest orange-producing regions in the world, Redlands is an important centre, shipping about 5000 carloads of oranges a year, besides large quantities of other fruit. Among its manufactures are brick, piping, and lumber products. Redlands was settled in 1881 and incorporated in 1888. Pop., 1900, 4797; 1910, 10,449; 1915 (U. S. est.), 13,428.

RED LEAD. See MINIUM; PAINT, MINERAL.

REDLEG. The red-legged partridge. See PARTRIDGE.

RED-LETTER DAY. A lucky day, a fortunate or auspicious day; so called because in the old liturgical books the greater holy days were always marked with red letters. See RUBRIC.

REDLICH, rāt′lĭk, JOSEPH (1869–). An Austrian legal scholar, born at Göding. He became a professor at the University of Vienna and in 1910 lectured at Harvard University. In 1915 he made investigations in the United States for the Carnegie Foundation and as a result published *The Common Law and the Case Method in American University Law Schools.* Redlich praised highly the high standards of law teaching in the United States. While approving the case method, he warned against the danger of its exclusive use. His other publications include: *Englische Lokalverwaltung* (1901; Eng. trans. as *Local Government in England,* 1903); *Recht und Technik des englischer Parlamentarismus* (1905; Eng. trans. as *The Procedure of the House of Commons,* 3 vols., 1908); *Das Wesen der österreichischen Kommunalverfassung* (1910).

RED LIQUOR. A crude aluminium acetate used as a mordant in calico printing. It is prepared in various ways, often by dissolving eight parts of alum in boiling water, which is then added to a solution of six parts of lead acetate, and the mixture is well stirred. Lead sulphate is formed, which is precipitated as a heavy mass, the supernatant clear liquid being the red liquor.

RED LODGE. A city and the county seat of Carbon Co., Mont., 62 miles southwest of Billings, on the Northern Pacific Railway (Map: Montana, G 4). Situated 5500 feet above the sea level, it is the commercial centre for a farming, stock-raising, and coal-mining district. Settled in 1887, the city was incorporated in 1894. Pop., 1900, 2152; 1910, 4860.

RED MEN, IMPROVED ORDER OF. A secret, charitable, and benevolent fraternity which in its present form was reorganized at Baltimore, Md., during the winter of 1833–34. It traces its origin, however, back to the Sons of Liberty, the secret revolutionary society which first appeared in Maryland in 1764–65, and through them to the various Tamina societies into which the Sons of Liberty merged in 1771–1810, and finally to the Society of Red Men formed at Philadelphia in 1813, at first political and afterward social and convivial, which virtually became extinct about 1830. See SONS OF LIBERTY; SECRET SOCIETIES, PATRIOTIC-POLITICAL.

The reorganized or Improved Order of Red Men eliminated both politics and conviviality and adopted as its motto "Freedom, Friendship, and Charity." George A. Peter, first sachem of Logan Tribe No. I of Baltimore, is considered the founder of the order. During the first 14 years of the life of the reorganized fraternity only 10 tribes, as Red Men's Lodges are called, were formed, but from 1880 to 1895 it grew rapidly, is now found in all the States of the Union and has maintained a large annual increase, the total in 1915 being more than 496,000. Tribes have also been established in the Panama Canal Zone, in the Hawaiian Islands, and in the Philippines, but membership there is not large. The reorganized society possesses quite different characteristics from the several secret political associations which it is said to have succeeded and attracts attention in that in a circumscribed way it seeks to conserve the history, customs, legends, expressions, words, and names of the aboriginal Americans, although North American Indians are not eligible to membership. The Improved Red Men meet in a wigwam on such and such a sun of a certain moon, where a council fire is kindled instead of the meeting being called to order, and is quenched when the gathering adjourns. Money is described as fathoms, feet, and inches, instead of dollars, dimes, and cents, and every initiate who becomes an adopted paleface is invested with a new proper name, often that of a bird or animal. The ceremonials of the order include the degrees of adoption, hunter, warrior, and chief. The Chieftain's League is a uniformed rank within the organization, and the Degree of Pocahontas is the branch to which women relatives of Red Men may become members, together with such of the Red Men themselves as choose to join the order. The total membership of the Degree of Pocahontas is about 86,000, of which about 50,000 are women.

RED'MOND, JOHN (EDWARD) (1851–). An Irish parliamentary leader, born in Waterford. He studied at the Jesuit College of Clongowes in Kildare and at Trinity College, Dublin, entered the House of Commons for New Ross in 1881, and was called to the bar at Gray's Inn, London, in 1886. In the House of Commons, where he sat for New Ross until 1885, for North Wexford from 1885 to 1891, and subsequently for Waterford, he became one of the most prominent organizers of the Home Rule propaganda. On the break in the Nationalist ranks consequent on the Parnell (q.v.) divorce case, Redmond sided with the minority which supported Parnell's leadership; but in 1900 he became a leader in the movement for union, and was chosen to succeed Dillon as head of the reorganized party. His leadership was aggressive and able. In 1905 he visited the United States on matters connected with the cause of Home Rule. As a result of the great triumph won by the Liberals in the election of January, 1906, the Home Rule agitation under Redmond's leadership took on renewed activity and was continued until the passage of the Home Rule Bill in 1914. In May, 1915, presumably to conciliate Nationalist Ireland, Redmond was offered a place in Asquith's coalition cabinet, but he declined. Consult: Justin McCarthy, in *British Political Portraits* (New York, 1903); L. G. Redmon-Howard, *John Redmond, the Man and the Demand* (ib., 1911); A. G. Gardiner, in *Prophets, Priests, and Kings* (ib., 1915).

RED OAK. A city and the county seat of Montgomery Co., Iowa, 54 miles by rail east by south of Omaha, Neb., on the East Nishnabotna River and on the Chicago, Burlington, and Quincy Railroad (Map: Iowa, B 3). It makes calendars, concrete pipe, and flour, and has ironworks and a canning factory. Pop., 1900, 4355; 1910, 4830.

RED OCHRE. See HEMATITE.

REDON, re-dôn', ODILON (1840–1916). A French painter, etcher, and lithographer. He was born at Bordeaux and passed his youth in a remote part of La Gironde, the romantic aspect of which left its impress on his character and art. Owing to physical weakness his education began late. He first took up painting in the atelier of Gérôme, but he was more influenced by association with the botanist Clavaud, who encouraged his predilection for Delacroix. Redon's art is essentially visionary, but expressed in the language of reality. It shows mastery of chiaroscuro and of the rhythmic line. A spirited lithographer and etcher, Redon also designed tapestries for the Gobelins. In the Luxembourg he is represented by "Les Yeux Clos" (Closed Eyes). Consult Redon, "Confessions," German translation, in *Die graphischen Künste* (Vienna, 1913).

REDONDELA, rā'dōn-dā'lȧ. A town of northwest Spain, in the Province of Pontevedra, situated at the head of the Bay of Vigo, 12 miles south of Pontevedra (Map: Spain, A 1). The inhabitants are chiefly engaged in fisheries. Pop., 1900, 11,488; 1910, 11,985.

REDON'DO BEACH. A city in Los Angeles Co., Cal., about 20 miles southwest of Los Angeles, on the Pacific Ocean and on the Atchison, Topeka, and Santa Fe and the Pacific Electric railroads (Map: California, G 9). It is a popular health and pleasure resort and has a large pavilion, bathhouse, various amusement places, and good public schools. There are large wharves and railroad shops. Pop., 1900, 855; 1910, 2935.

REDOUBT, rė-dout', frequently spelled REDOUT (OF. *reduit*, Fr. *réduit*, from ML. *reductus*, refuge, redoubt, from Lat. *reducere*, to lead back, from *re-*, back again, anew + *ducere*, to lead). A field fortification. A closed fieldwork in which all or nearly all of the angles are salient. A redoubt varies in form and size according to the exigencies of the situation and the time at the disposal of the defenders. The trace or plan is usually some development of that of the lunette (q.v.), with a depth from one-quarter to one-half the length of the front. If advantageously located its shallowness aids in forming a poor target for the enemy's artillery. It is still deep enough to permit the construction of a parade which will secure the troops defending the gorge or rear. Redoubts are used where a small body of troops desires to make a strong defense. They are also used on ground immediately expected to be a battlefield. After an army takes position hasty intrenchments are constructed along the whole front, as described under *Field Fortifications* (see FORTIFICATION), and the strongest points are occupied with redoubts. Where the size of modern armies has increased so greatly that field manœuvres become impracticable and operations assume the character of a siege, the redoubt becomes simply a stronger point in a strong line. A redoubt should conform in plan as closely as practicable to the natural shape of the ground and be as inconspicuous as may be. The front parapet is designed to resist heavy field and siege gun fire; the rear to resist rifle, machine, and field gun fire. Bomb proofs are built in the work for dressing stations and for protection against mortar and curved fire.

The size of the redoubt is adjusted to the force which is to occupy it and to the ground. It should ordinarily give a yard of front to two men. If not properly located and inconspicuously designed, a redoubt may, by virtue of its inclosed form and restricted and sometimes crowded interior space, become a good target for the enemy's artillery.

Owing to the increased use of mortar and high-angle and explosive-shell fire and to the activity of air craft, increased weight is being given in design to concealment from view and to overhead cover. The cavity caused by the excavation of earth for the construction of the parapet is called the ditch, and constitutes a formidable obstacle to the enemy.

The sides of the ditch are known as the escarp and the counterscarp, respectively. (See Plan in article FORTIFICATION.) Chevaux-de-frise (q.v.) or similar constructions are placed along the bottom of the ditch. The parapet in modern redoubts is low and wide. The exterior slope of the parapet has been found to resist artillery fire to greater advantage when left at its natural slope; but the superior slope is constructed with an incline of 1 in 6, permitting the defenders to observe the ground in front of the ditch without greatly reducing the strength of the parapet. The interior slope (1 in 3 or 4) is strongly revetted and provided with ample elbow rests and positions for machine guns. Traverses (q.v.) are constructed similarly to the parapet, and are usually thrown across the covered way or other important points as a protection against enfilade fire or (as parados) to defend the troops garrisoning the rear face from fire coming from the front. In case of an attack from the rear the functions of the various parts are reversed. See SIEGE AND SIEGE WORKS.

REDOUBT. An active volcano (11,270 feet high) on the west shore of Cook Inlet, Alaska; last active in 1903 (Map: Alaska, H 5). Also called Mirando, Viesokaia (high), and Goreloi (burning).

REDOWA, rĕd'ō̇-wȧ (Boh. *rejdowák*, *rejdowachka*, from *rejdowati*, to turn around). A Bohemian dance introduced into Paris and London about 1846. In Bohemia two varieties exist: the Rejdővak in $\frac{3}{4}$ or $\frac{3}{8}$ time and the Rejdővacke in $\frac{2}{4}$ time. The dance resembles the Polish mazurka. Meyerbeer introduced it into his opera *Le prophète* in 1849.

RED'PATH, JAMES (1833–91). An American journalist and political writer, born in Berwick-on-Tweed, Scotland. He went to New York at 18 and joined the staff of the *Tribune*. By his writing he came to be known as an Abolitionist. Through a Haitian bureau and his weekly, *Pine and Palm*, he induced several thousand negroes to emigrate to Haiti, where he had been commissioner of education in 1859. During the war he was with the armies of Sherman and Thomas. Later, while superintendent of education at Charleston, he reorganized the school system of South Carolina. During the Irish famine of 1881 he represented the New York *Tribune* in the famine district, and afterward lectured and founded *Redpath's Weekly* (1881–83) to promote the Irish cause. He was an editor of the *North American Review* and published books on Haiti, Ireland, and the South.

REDPOLL, rĕd'pōl'. A small northern linnet-like finch of the small genus *Acanthis*, visiting the United States and central Europe in winter. The plumage is streaky, with dusky white and buffy shades, the face and throat often blackish. The males have the crown crimson and the breast rosy or carmine. All the redpolls are birds of high latitudes and breed in extreme Arctic regions, making nests of dried grasses, lined with hair, feathers, and down, in a low bush or tuft of grass, and laying pale-blue, finely speckled eggs. The best known in America is the common redpoll (*Acanthis linaria*), a bird less than 5½ inches long, appearing irregularly in the Northern States, in flocks of considerable size and, like goldfinches, feeding on small seeds.

RED POLLS. See CATTLE.

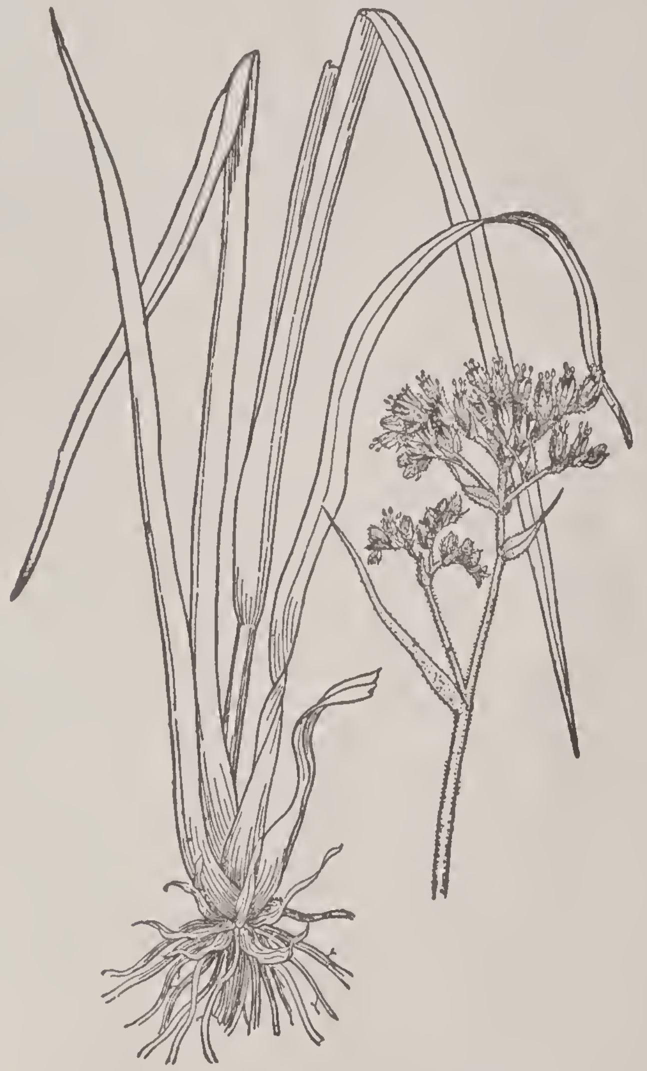
RED RIDING HOOD, LITTLE. The popular fairy tale of the little girl devoured by the wolf which personates her grandmother. The source of the English version is *Le petit chaperon rouge* in Perrault's *Contes du temps passé* (1677). Tieck gives the tale in his *Volksmärchen* in 1795, and the brothers Grimm in their collections of fairy tales. In the latter the wolf is cut open by a hunter and the child is set free; this feature allies the story with many monster-swallowing incidents in various folklore, while the tale itself in varying forms is widespread.

RED RIVER, or SONG-KOI. A river of Tongking, French Indo-China. It rises in the mountains of south China and flows in a nearly straight southeast course of over 600 miles, emptying into the Gulf of Tongking through a large delta (Map: French Indo-China, D 2). In its upper reaches the river flows through deep gorges and becomes navigable only on its entry into Tongking at Lao Kai, where steamer service has been provided. Hanoi, the capital of Tongking, lies on its banks, and the river is of considerable commercial importance. Its main tributaries, the Black and the Clear, are navigable for some distances, and its delta is the most fertile and populous part of the country.

RED RIVER. The southernmost of the large tributaries of the Mississippi. Its headwaters include several forks all of which originate in northern Texas. The main stream flows east, forming the boundary between Texas and Oklahoma until it enters Arkansas, where it turns to the south and, entering Louisiana, traverses the State in a southeasterly direction to its junction with the Mississippi, 341 miles above the mouth of the latter (Map: Texas, E 3). It is 1045 miles long and drains an area of 89,970 square miles. For the first 60 miles it flows through a cañon with perpendicular rocky sides 500 to 800 feet high, after which it enters a sandy and arid plain, where it broadens out to a width of nearly 3000 feet, but with a very shallow depth. Farther down it enters the fertile alluvial bottoms, which throughout its middle course are densely wooded. Here the river shows a remarkable tendency to form snags or rafts of driftwood. Up to 1873 such a raft of tree trunks and driftwood 32 miles long extended from a point some distance above Shreveport, La. In that year a navigable channel was cut through, and now the river is kept clear by constantly removing the floating timber. In its lower course in Louisiana the Red River sends out numerous bayous, some of which rejoin it, while others penetrate directly to the Gulf of Mexico, parallel with the Mississippi. It has a navigable length of about 1250 miles, and its tributaries, chief of which is the Washita, afford in addition 2100 miles of navigable waterways. Steamers drawing 4 feet can ascend to Shreveport at all seasons except in extreme low water, while at high water they can reach nearly to the Texan boundary. Consult Marcy, *Exploration of the Red River of Louisiana* (Washington, 1853).

RED RIVER. A river rising in the northwestern part of Minnesota a few miles from the sources of the Mississippi (Map: North Dakota, H 3). It flows first southward through a chain of numerous lakes, then westward to the boundary between Minnesota and North Dakota, which it follows in a northerly course until it enters Manitoba, where it empties into the southern extremity of Lake Winnipeg. Its length is about 700 miles. Its course lies through an almost perfectly level plain which was formerly the bottom of Lake Agassiz (see LAKE) and which is a famous wheat-producing region. The river and its branches have cut narrow channels through the plain with clay banks 20 to 60 feet high. A southern branch connects through Lake Traverse with the Minnesota and Mississippi rivers, so that during high water small steamers may sometimes pass from the Mississippi to Lake Winnipeg. The main stream is navigable from Grand Forks to Winnipeg. Owing to the difference in latitude between the upper and lower courses, spring sometimes arrives at the former while the latter is still icebound, so that the waters are piled up and inundate the plain.

RED'ROOT'. A popular name for various unrelated plants. One of the best known is *Lachnanthes tinctoria*, of the family Hæmodoraceæ, which grows in wet sandy soils near the coast of the eastern United States. It has sword-shaped leaves mostly close to the ground and an unbranched almost leafless stem which bears at its summit a dense compound cyme of woolly yellow flowers. The perennial roots contain a red coloring matter sometimes used in dyeing. Alkanet (*Alkanna*, or *Anchusa tinctoria*), certain American pigweeds (*Amaranthus* spp.), and *Ceanothus americanus* are also called redroot. See ALKANET; AMARANTH; CEANOTHUS.



REDROOT (*Lachnanthes tinctoria*).

RED'RUTH. A town in Cornwall, England, the centre of a famous mining district, 9½ miles northwest of Falmouth (Map: England, A 6). In 1792 gas was first used here for lighting purposes. Tin, from numerous mines in the vicinity, is smelted in the town, and iron foundries are in operation; another important product is copper. Pop., 1901, 10,451; 1911, 10,814.

RED SANDSTONE. A term formerly applied to the combined Devonian and Permian rocks when their relations to the Carboniferous strata were unknown. The discovery that one part of the Red Sandstone was below the coal, while the other was above it, caused the division into the Old Red Sandstone, or Devonian, and the New Red, or Permian. For some time after this division the original term was retained by a few geologists, but it is now quite given up. See OLD RED SANDSTONE; PERMIAN SYSTEM.

RED SCALE. The name applied in Florida to *Aspidiotus ficus* and in California to *Aspidiotus citri,* two common and destructive enemies of the orange. See ORANGE INSECTS.

RED SEA (Lat. *Mare Rubrum,* Gk. Ἐρυθρὴ Θάλασσα, *Erythrē Thalassa*), or ARABIAN GULF. An arm of the Indian Ocean separating the Arabian peninsula from northeast Africa and lying between lat. 12° 30′ and 30° N. (Map: Africa, H 2). It extends in a northwest direction from the Strait of Bab el Mandeb, 20 miles wide, through which it communicates with the Gulf of Aden, to the Isthmus of Suez, and is about 1200 miles long. It is narrowly elongated in shape, with a breadth between 100 and 200 miles. In the north the sea divides into two arms, cutting off the Sinai Peninsula: these are the Gulf of Suez in the west, 170 miles long and 25 miles wide, and the Gulf of Akaba in the east, 110 miles long and 12 miles wide. The Gulf of Suez is connected by the Suez Canal (q.v.), about 100 miles long, with the Mediterranean. The basin of the Red Sea is formed by a line of fracture running through the great Archean mass capped by the limestone plateaus of Egypt and Arabia, and is a part of the great series of rift valleys which extends from the Dead Sea to Lake Tanganyika. The Archean rocks are exposed here and there along the coast. A branch fissure with steep rocky sides forms the Gulf of Akaba and runs northward as the depression called El Arabah, the deep sink of the Dead Sea, and the valley of the Jordan. The shores of the Red Sea are bordered on the Arabian side by sandy deserts, which form a narrow strip backed by the limestone range. On the Egyptian side there are wide, sandy plains in the north, rising farther south into elevated table-lands and finally into the mountains of Abyssinia. Each shore, particularly the east, is lined with immense coral reefs, both barrier and fringing; the former in some places are 25 miles or more from land and inclose channels. They have also occasioned numerous islands and archipelagoes. The principal groups are the Farsan Islands near the Arabian shore and the Dahlak Islands near the African. The mean depth of the Red Sea is about 2000 feet. Through the greater part of its length runs a central channel with a depth exceeding 3000 feet, divided by comparatively shallow ridges into three basins, of which the northern and the southern have a maximum depth of about 4200 feet and the central of nearly 7500 feet. The Strait of Bab el Mandeb is 1200 feet deep. In the Gulf of Suez the depth is scarcely more than 200 feet.

The mean temperature of the surface water is 77° in the north, 80° near the middle, and 84° in the south. Below a depth of 1200 feet there is a uniform temperature of 71° in all parts of the sea and down to the greatest depths. The sea differs in this respect from the open ocean, where the temperature continues to fall through a much greater depth. The surface temperature of the Red Sea sometimes rises above 100°, and there is an enormous evaporation, the air being almost constantly saturated as fast as it is supplied by the winds. The heat being intense, the climate on the Red Sea is depressing because of this great humidity. The salinity of the Red Sea amounts to about 4.2 per cent, increasing with the depth, and is nowhere as low as that of the ocean, 3.5 per cent. The tides are irregular and in some places imperceptible. The prevailing winds are north and northwest, but they change to the northeast during winter. The marine flora and fauna of the Red Sea are very rich and interesting. The indigenous species are quite different from those of the Mediterranean, showing that the two seas must have been separated since the Eocene epoch. Since the opening of the Suez Canal, however, there has been a considerable intermigration. From the earliest times the Red Sea has been a great highway of commerce between India and the trading peoples of the Mediterranean lands, and was used successively by the Egyptians, the Phœnicians, the Arabs, and in the Middle Ages by the Venetians, until the discovery of the route around the Cape of Good Hope. Since the opening of the Suez Canal in 1869 it has regained its importance as the main route of commerce between Europe and the East.

Consult: W. Kropp, "Physical Geography of the Red Sea," in United States Hydrographic Office, *Publication No. 39* (Washington, 1872); Josef Luksch, *Vorläufiger Bericht über die physikalisch-oceanographischen Untersuchungen im Roten Meer* (Vienna, 1896); Hood, "The Red Sea Currents and Navigation," in *Nautical Magazine,* vol. lxviii (London, 1899).

REDSHANK. One of the best known of the British and European sandpipers (*Totanus calidris*), having conspicuous red feet. Cf. GREENSHANKS.

RED-SHOULDERED HAWK. See BUZZARD; HEN HAWK.

RED SNAPPER. See SNAPPER.

RED SNOW. A phenomenon similar to blood rain (q.v.), noted at rare intervals and best exemplified in the Arctic regions where it has been described by Captain Ross and others. Minute particles, commonly of organic nature, that existed in the atmosphere at the time of the snowfall are the source of the coloration.

RED SPIDER. A name among florists for one of the spinning mites of the genus *Tetranychus,* and particularly of *Tetranychus telarius,* a cosmopolitan species, probably originally European. They frequently do considerable damage to plants, causing the leaves to turn a rusty color, but they may be kept in check by the application of a kerosene-emulsion spray to which flowers of sulphur has been added. See HOP INSECTS; MITE.

RED′START (from *red* + *start,* AS. *steort,* Ger. *Sterz,* tail; perhaps connected with OHG. *sturzen,* Ger. *stürzen,* to hurl, or with Gk. στόρθη, *storthē,* prong). Either of two small warblers. The American redstart (*Setophaga ruticilla*) is one of the wood warblers (q.v.). The male is black, with white belly, and the sides, basal half of wing, and tail feathers are bright salmon red; the female is ashy where the male is black and yellow where he is salmon. It winters in tropical America, but appears in the United States early in the spring. The nest is built of fine strips of bark, leafstalks, and the like, lined with fine rootlets, in the fork of a small tree some distance from the ground. The eggs are white spotted with brown. The redstart feeds wholly upon insects, which it pursues with great activity. He is not much of a songster, but his beauty and liveliness make him a well-known and popular bird. See Colored Plate of AMERICAN WOOD WARBLERS with the article WARBLER.

The European redstart is a similar bird, but of the family Sylviidæ, and is widely diffused over Europe, Asia, and the north of Africa. It has a very soft, melodious song, which is continued during the breeding season far into the night and resumed at early dawn. In confinement it becomes very tame, and has been known to imitate the song of other birds, and even to learn a tune.

RED-TAILED HAWK. See BUZZARD; HEN HAWK.

RED TAPE. A term used to denote excessive routine and formality in the management of official affairs; a servile adherence to precedent. Before the invention of the modern appliances for securing papers all official documents were tied together by red cotton or linen tape. The necessary delay caused by the undoing of tapes by slow-moving government officials before business could be transacted came at length to stand as representative of all delays.

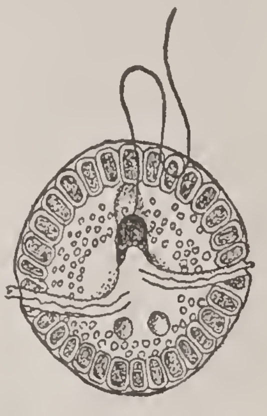
REDTOP GRASS (*Agrostis alba* and its variety *vulgaris*). This grass varies greatly in its habit of growth. Some of its forms are tall growing and are largely cultivated for hay, being usually sown in mixtures with timothy and clover. It is one of the best grasses for permanent pastures in the New England and Eastern States, and thrives best in moist soils unsuited to other valuable grasses. When once established this grass will maintain itself against encroachment by weeds or less valuable grasses. Some forms are very useful for lawns. This grass is also called fiorin, bent grass, and, in the eastern United States, herd's grass. The names are all applied to other species of *Agrostis* in different regions. In Alaska the name "redtop" is applied to *Calamagrostis langsdorfii* and other species.

REDUC'TASE. See OXIDASE.

REDU'PLICA'TION (Lat. *reduplicatio*, from *re-*, again + *duplicare*, to double, from *duplex*, double, from *duplus*, double, from *duo*, two + *-plus*, -fold). In inflection (q.v.), a prefix to a word which normally consists of the initial consonant or consonants with a vowel which is either the vowel of the root (q.v.) of the word or is *e*. The reduplication is generally found in verbs, although it sometimes occurs in the formation of nouns. In the verb it is a characteristic in Sanskrit (q.v.) and Avesta (q.v.) of the intensive and desiderative formations, as Skt. *hanti*, kills, *jañghanti*, kills repeatedly, *jighāṁsati*, desires to kill. It is also found in some aorists, as Skt. *dharati*, holds, *adīdharam*, I held, and in a number of present formations, Skt. *dadāmi*, Gk. *δίδωμι*, I give. It is most usually found, however, in the perfect tense, of which it is a distinguishing mark in Sanskrit, Avestan, and Greek, as Skt. *dvēsti*, hates, *didvēṣa;* Av. *didvaēža*, I hated; Gk. λύω, I loose, λέλυκα, I loosed. There are sporadic instances in Latin, as *mordeo*, I bite, *momordi*, I bit, or *tendit*, he stretches, *tetendit*, he stretched; while examples are comparatively numerous in Gothic, as *faífāh*, seized, from *fāhan; haíháit*, called, from *háitan; taítōk*, touched, from *tēkan*. Reduplication is also found in many languages not belonging to the Indo-European family where it usually signifies increase, as Malay *tuwantuwan*, masters (*tuwan*, master), Jap. *jamajama*, mountains, etc. In English it has occasionally a diminutive sense, as *flip-flap, snip-snap*. The original force of the reduplication seems to have been intensive or perfective. This view explains its use in the perfect and aorist tenses of the verb and also its employment in the Sanskrit intensive and desideratives. Its occurrence in nouns is probably based on analogy with its normal use in the conjugation of verbs. Consult Karl Brugmann, *Vergleichende Grammatik der indogermanischen Sprachen*, vol. ii (Strassburg, 1913), and Leonard Bloomfield, *Introduction to the Study of Language* (New York, 1914).

RED VIRGIN, THE. See MICHEL, LOUISE.

RED WATER. At times the water of the open sea near coast lines and of harbors more or less suddenly turns red and at the same time the phenomenon is accompanied by the death of fishes and mollusks in great quantities. This has been found to be due to the presence in enormous numbers of an animalcule known as *Peridinium* (or *Glenodinium*). This is an infusorial form representing a singular type of flagellate protozoa, class Mastigophora and order Dinoflagellata. It differs from ordinary flagellate infusoria by being protected by a remarkable and often beautifully ornamented and complex shell formed of cellulose. The body is nearly symmetrical; from a longitudinal groove springs a large flagellum, while a second flagellum lies in a transverse groove. The protoplasm in one species examined contains chromatophores colored with chlorophyll, or an allied pigment of a yellow color, called diatomin. Other forms live in fresh water.



GLENODINIUM.

RED WATER, BLOODY URINE, MOOR ILL, HÆMATURIA, HÆMAGLOBINURIA. An affection of cattle, and occasionally of sheep, attributed to eating coarse, indigestible, innutritive food, continued exposure to inclement weather, and other indefinite causes. Attention to the proper nutrition of the stock, a supply of good water, and the improvement of pastures by draining, liming, and manuring, have been recommended as preventives. The term has also been applied to the specific disease Texas fever, due to the bloodstained urine. Consult V. T. Atkinson and others, *Special Report on Diseases of Cattle*, published by the United States Bureau of Animal Industry (rev. ed., Washington, 1912), and J. W. Kalkus, "A Preliminary Report on the Investigations of Bovine Red Water (Cystic Hematuria) in Washington," in Washington State Agricultural Experiment Station, *Bulletin No. 112* (Olympia, 1913).

RED'WAY, JACQUES WARDLAW (1849–). An American geographer, born near Murfreesboro, Tenn. He was educated at the University of California and studied also at Munich. He was instructor in chemistry at the former institution, later served as professor of physical geography and chemistry at the State Normal School of California, engaged in mining engineering and exploration in Arizona and California in 1870–80, and traveled extensively in South America, Europe, and Asia. Redway edited *Sir John Mandeville's Travels* (1899) and Kinglake's *Eothen* (1899) and is author of a *Manual of Geography* (1887) and joint author of the "Natural Geographies Series" (1897, 1907) and of many other textbooks in this and related fields.

RED WHELK. The common spindle shell (q.v.).

RED WING. A city and the county seat of Goodhue Co., Minn., 40 miles southeast of St. Paul, on the Mississippi River, here spanned by a high bridge, and on the Chicago, Milwaukee, and St. Paul and the Chicago Great Western railroads (Map: Minnesota, E 6). It has the State training school for delinquent children, the Red Wing Seminary, the Lutheran Ladies' Seminary, two public parks, a home for the aged, and city and private hospitals. Red Wing is situated in a rich agricultural region, but is better known for its manufactures of stoneware, sewer pipe, furniture, linseed oil, malt, beer, brick, lime, hats, flour, lumber products, shoes, boats, cigars, leather, wagons, and cooperage and foundry products. The government is vested in a mayor, elected biennially, and a unicameral council. Settled in 1845, Red Wing was incorporated in 1858. Pop., 1900, 7525; 1910, 9048; 1915 (U. S. est.), 9850.

RED'WING'. 1. An American blackbird (*Agelaius phœniceus*) of the oriole family (Icteridæ). The male in full plumage is jet black, with the bend of the wing bright scarlet, bordered with buff. The female is variegated with brown and buff, black and white. The redwing is 9½ inches long. It breeds throughout the United States, but winters from Virginia southward. The nest is built of coarse grass and rushes among the bushes or reeds of a swamp, and the eggs are pale blue, with peculiar penstroke markings of dark purple or black. (See Colored Plate of Eggs of American Song Birds.) The note is a loud clear call well imitated by the syllables *cong-ka-rée*, the last one accented and prolonged. The redwing is one of the first of the spring migrants in the northern United States and often appears in large flocks. Even when breeding the birds are more or less sociable, and several pairs are usually found in the same marsh. Like its relatives, the other blackbirds and the bobolink, the redwing feeds on both insects and seeds and also enjoys unripe corn or grain, and occasionally raids the maize fields to a destructive extent. See Blackbird.

2. An English thrush (*Turdus iliacus*) which spends the summer in the northern parts of Europe and Asia and migrates southward in winter as far as the Mediterranean. The general color is a rich clove brown on the head, upper parts of the body, and tail; the lower parts whitish, tinged and streaked with brown; the under wing coverts and axillary feathers bright reddish orange. The redwing congregates in large flocks and has an exquisite song.

3. One of several other birds with red on the wings, as one of the South African partridges (*Francolinus levaillanti*).

REDWITZ, rĕt'vĭts, Oskar, Baron von (1823–91). A German poet, dramatist, and novelist, born in Lichtenau, near Ansbach. He is best known for his ultrapatriotic poem *Das Lied vom neuen deutschen Reich* (1871; 11th ed., 1876), a kind of epic in sonnets. Other noteworthy poems by him are *Amaranth* (1849; 44th ed., 1904), a tale in verse, and *Odilo* (1876; 4th ed., 1883). A novel, *Hermann Stark* (1868), and the dramas *Philippine Welser* (1859), *Der Zunftmeister von Nürnberg* (1860), and *Der Doge von Venedig* (1863) may also be named. Consult A. Bacmeister, *Oskar Redwitz und seine Dichtungen* (Hanover, 1854), and Gmelin and Ernst, "Zur Entstehungsgeschichte des Amaranth," in *Euphorion*, vol. iv, supp. (Leipzig, 1897).

RED WOLF. See Maned Wolf.

RED'WOOD' (*Sequoia sempervirens*). A California coniferous tree which grows upon the Pacific coast mountains, next in size to the tree commonly called *Sequoia gigantea*, or big tree. (See Sequoia.) It often attains a height of 250 feet and sometimes 300 feet, with a diameter, in the largest, of 15 feet. The young wood is red, but on exposure to the air and light it sometimes fades. The timber, which is common on the Pacific coast, is soft and straight-grained, easily worked, durable, and well suited for inside finishing of houses, since it takes a good polish. The redwood sends up suckers from the stumps and seeds itself well, so that the forests are maintained. Redwood is also a name given to *Soymidia febrifuga*, a tree of India, where the wood is much used as a dye. See Sequoia, and Plate of Sequoia.

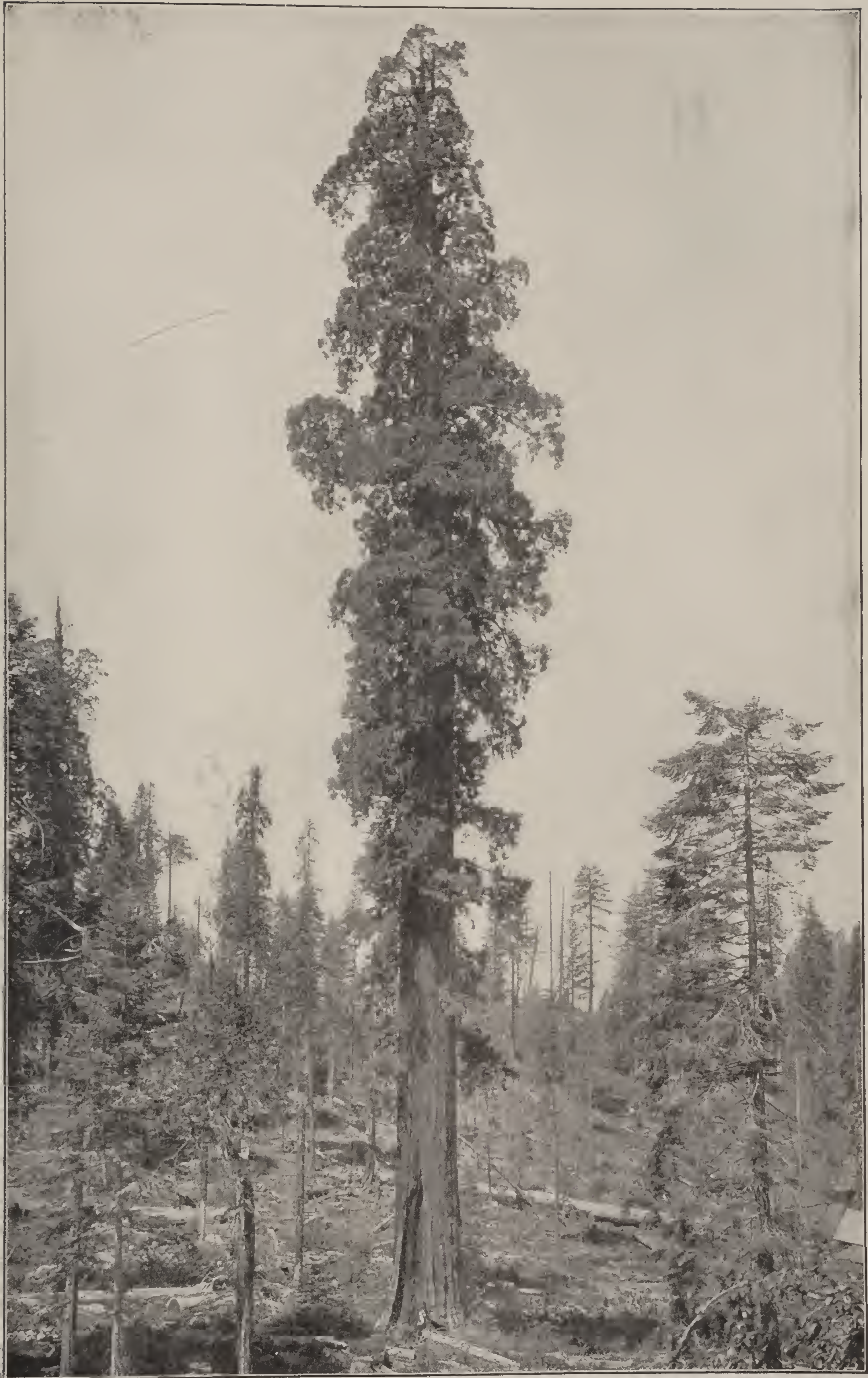
A BRANCH OF REDWOOD.

REDWOOD, Sir Boverton (1846–). An English consulting chemist and authority on petroleum. He was born in London, studied at University College School, and learned pharmacy. As an expert on coal oils Redwood traveled in Europe and America and acted as a member of technical juries of award in international expositions. He became an authority in regard to legislation on oil trade. He was knighted in 1905, and was made Baronet in 1911. His published works include: *Cantor Lectures on Petroleum and its Products* (1886); *Petroleum: Its Production and Use* (1887); *Treatise on Petroleum* (2 vols., 1896; 3d ed., 3 vols., 1913); *The Detection of Inflammable Gases* (1896), with Clowes; and, with J. H. Thomson, *Handbook on Petroleum* (1901; 2d ed., 1906) and *The Petroleum Lamp* (1902).

REE. A North American Indian tribe. See Arikara.

REED (AS. *hrēod*, OHG. *hriot, riot*, Ger. *Ried, Riet*). The common name of certain tall grasses growing in moist or marshy places. The common reed (*Phragmites communis*) is abundant in continental Europe, Asia, and America in wet meadows and stagnant waters and by the banks of rivers and ditches. It grows chiefly in rich alluvial soils. The hard, almost woody culms are 5 to 10 feet high and bear at the top a large reddish-brown or yellowish much-branched panicle. They are used for making garden screens, light fences, and frameworks to be covered with clay in partitions and floors. Cattle readily eat the young shoots, but refuse the hard old ones. The plant rarely perfects its seed, but spreads by its rootstocks, which often extend for 20 or 30 feet. Nearly allied to

REDWOOD



SEQUOIA SEMPERVIRENS

this is *Arundo donax*, the largest of European grasses. It is 6 to 12 feet high and has thick, hollow, woody culms and a purplish-yellow panicle, silvery and shining from silky hairs. The woody stems are an article of commerce and are used by musical-instrument makers for reeds of clarinets and mouthpieces of oboes. They are also made into walking sticks and fishing rods. The creeping roots contain much starch and some sugar. *Arundo karka* is supposed to be the grass called Sur in Sinde, of which the flower stalks are very fibrous; and the fibres, being partially separated by beating, are twisted into twine and ropes. The sea reed (*Ammophila arundinacea*) grows along the sandy shores of the Great Lakes and the Atlantic Ocean and is one of the best sand-binding grasses for regions adapted to its growth. The small cane *Arundinaria tecta* is called reed in the United States. *Cyperus papyrus*, from which the ancients made paper, is often called paper reed.

REED. In music, a thin strip of cane, wood, or metal secured at one end in front of an aperture, through which a current of air passing sets it in vibration. The vibrations thus started are either communicated to an inclosed column of air or are released into the open air, in either event producing a musical sound. The reed is of two kinds, the *beating* reed and *free* reed. The former is used in the reed pipes of an organ (q.v.) and requires to be placed within a tube in order to produce a musical sound. It consists of a metallic cylinder, with the front part cut away, and a brass spring or tongue placed against the opening and attached at the upper end. The resultant note is dependent for its pitch on the length of the tongue, which is regulated by a strong spring of wire pressing against it. The quality of the sound is determined to a large extent by the length and form of the pipe in which the reed is placed. The double reed consists of two beating reeds striking against each other. The free reed differs from the beating reed in that the tongue is a little smaller than the opening and strikes, not the edge of the opening, but the air. Its note is more smooth and mellow than that of the beating reed, and it has the advantage of not requiring a pipe, which is a necessary appendage to the latter. Besides being occasionally adapted to organ pipes, it is used without a pipe in the concertina and harmonium. The history of the beating reed can be traced back to the earliest known civilizations; the single form is now represented by the clarinet, chalumeau, and saxophone; while the double form is now seen in the krumhorn, oboe, and bassoon. A combination of both forms is found in the bagpipe (q.v.). The free reed was introduced into Europe in the eighteenth century, its prototype being the Chinese chêng. See HARMONIUM; MUSICAL INSTRUMENTS.

REED, ANDREW (1787–1862). An English clergyman and philanthropist. He was born at Beaumont House, St. Clement Danes, London. In 1807 he entered Hackney College and in 1811, after preaching in many parts of England, he settled in the Congregational Chapel at New Road, London. He continued the pastorate of this congregation until 1861, having built a new chapel in 1831. As a philanthropist his efforts were devoted to the establishment of orphan asylums. His other charitable works were the Asylum for Idiots, founded in 1846, and the Royal Hospital for Incurables, begun in 1855, with its home at Putney House, Surrey. He was the author of numerous hymns and of various works of a religious character, and of *A Narrative of a Visit to American Churches* (2 vols., 1836). Consult his *Memoirs*, edited by his sons (London, 3d ed., 1867).

REED, CHARLES ALFRED LEE (1856–). An American surgeon, born at Wolfe Lake, Ind. He graduated in 1874 from the Cincinnati College of Medicine and Surgery, where he was professor of gynæcology and abdominal surgery (1882–96). After 1902 he held the chair of clinical gynæcology in the Medical College of Ohio (University of Cincinnati). In 1898 he was president of the American Association of Obstetricians and Gynæcologists and in 1900 of the American Medical Association. In 1908 Reed was made Chevalier of the French Legion of Honor. His writings include: *Textbook of Gynecology* (1900; 2d ed., 1904); *Diseases of Women* (1913); *Marriage and Genetics* (1913).

REED, SIR EDWARD JAMES (1830–1906). A British naval engineer, born near Sheerness. He was educated at the School of Mathematics and Naval Construction at Portsmouth and became secretary of the Institution of Naval Architects. While head of the Board of Construction of the Admiralty (1863–70), he instituted the reconstruction of the British navy. In 1886 Gladstone appointed him Lord of the Treasury. He was a member of Parliament for Pembroke in 1874–80 and was returned for Cardiff in 1880–95 and again in 1900. He published: *Our Ironclad Ships* (1869); *Letters from Russia in 1875* (1876); *The Stability of Ships* (1884); and, in collaboration with Admiral Simpson, *Modern Ships of War* (1888).

REED, ELIZABETH (ARMSTRONG) (1842–1915). An American Oriental scholar, born at Winthrop, Me. She was married to Hiram V. Reed in 1860 and was the mother of Myrtle Reed (q.v.). In 1893 she was chairman of the Woman's Congress of Philology at Chicago and in 1896 became an editor of the *Course of Universal Literature*. For four terms she was president of the Illinois Woman's Press Association. She received honorary degrees from Northwestern and Illinois Wesleyan universities and Bethany College. Mrs. Reed was author of *The Bible Triumphant* (1866); *Hindu Literature: or, The Ancient Books of India* (1891); *Persian Literature, Ancient and Modern* (1893); *Primitive Buddhism: Its Origin and Teachings* (1896); *Daniel Webster: A Character Sketch* (1899); *Hinduism in Europe and America* (1914).

REED, ISAAC (1742–1807). An English biographer and Shakespearean editor, born in London, the son of a baker. His first notable book, *Biographia Dramatica* (2 vols., 1782), reedited (3 vols., 1811) by Stephen Jones, is still valuable. In 1785 Reed revised an edition of Shakespeare published originally by Dr. Johnson and George Steevens (q.v.). After Steevens's death he used the latter's notes in preparing a 21-volume edition (1803; reprinted, 1813). This is known as the "first variorum" Shakespeare. Consult E. Dowden, *Essays Modern and Elizabethan* (London, 1910).

REED, JAMES A. (1861–). An American legislator. He was born near Mansfield, Ohio, but was taken as a child to Linn Co., Iowa. In that State he was educated at Coe College and was admitted to the bar in 1885.

After practicing law for two years at Cedar Rapids, Iowa, he moved in 1887 to Kansas City, Mo., where he became a leader in Democratic politics. He served as prosecuting attorney of Jackson Co., Mo., from 1898 to 1900 and was then mayor of Kansas City until 1904. Reed was a delegate to the Democratic national conventions of 1908 and 1912, was elected United States Senator for the term 1911–17, and served as member of the executive committee of the Democratic National Committee after 1912.

REED, John Oren (1856–1916). An American physicist and university dean, born at New Castle, Ind. In 1885 he graduated from the University of Michigan, where, after studying at Harvard (1891–92), he was instructor (1892–94), assistant professor (1894–99), junior professor (1899–1905), and professor of physics. He was also dean of the summer session from 1899 to 1908 and of the Department of Literature, Science, and the Arts after 1907, and director of the Physical Laboratory after 1909. He took the degree of Ph.D. at Jena in 1897. His publications include: *A Manual of Physical Measurements* (1902; 3d ed., 1912), with K. E. Guthe; *College Physics* (1902); *College Physics* (1911), with K. E. Guthe; *High School Physics* (1913), with W. D. Henderson.

REED, Joseph (1741–85). An American patriot of the Revolutionary period. He was born at Trenton, N. J., and graduated at the College of New Jersey, now Princeton, in 1757. From 1763 to 1765 he studied law in England. He then began practice at Trenton and in 1767 became Deputy Secretary of New Jersey. On his return in 1770 from a second visit to England, where he married a daughter of Dennis Deberdt, the agent of Massachusetts in England, he removed to Philadelphia, served on the Committee of Correspondence, and was President of the Second Pennsylvania Provincial Congress in 1775. In 1775 he served as a delegate to the Continental Congress and became Washington's secretary and aid-de-camp. He was Adjutant General during the New Jersey campaign. In 1777 he declined the posts of Chief Justice of Pennsylvania and Commissioner of Indian Affairs and a promotion to the rank of brigadier general and remained in the army as a volunteer without pay, serving with credit in the battles of Brandywine, Germantown, and Monmouth. He was a member of the Continental Congress in 1778 and signed the Articles of Confederation. He was president of the Pennsylvania Supreme Executive Council from 1778 to 1781, in which capacity he helped to suppress the revolt of the Pennsylvania line in the latter year. He had previously caused the trial of Arnold for maladministration. During his administration he aided in founding the University of Pennsylvania and advocated the gradual abolition of slavery. Reed died March 5, 1785. Consult W. B. Reed, *The Life and Correspondence of Joseph Reed* (2 vols., Philadelphia, 1847). Consult also George Bancroft, *Joseph Reed: An Historical Essay* (New York, 1867), in which Reed is presented in an unfavorable light.

REED, Myrtle (1874–1911). An American author, daughter of Elizabeth Armstrong Reed. She was born in Chicago, where she graduated from the West Division High School. In 1906 she was married to James Sydney McCullough. Among her books, some of them very popular, are: *Love Letters of a Musician* (1899); *Lavender and Old Lace* (1902; new ed., 1907); *Pickaback Songs* (1903); *The Master's Violin* (1904); *A Spinner in the Sun* (1906; new ed., 1909); *Old Rose and Silver* (1909); *Master of the Vineyard* (1910; new ed., 1911); and, posthumously published, *Threads of Grey and Gold* (1913).

REED, Thomas Brackett (1839–1902). An American lawyer, political leader, and parliamentarian, born at Portland, Me., Oct. 18, 1839. He graduated at Bowdoin College in 1860; emigrated to California, where he taught school, in the meantime devoting his spare moments to the study of law; returned to Portland in 1864, and was appointed paymaster in the United States navy, in which capacity he served until his honorable discharge in November, 1865. The same year he was admitted to the bar and began the practice of law at Portland. In 1868–69 he was a member of the Lower House of the Maine Legislature and in 1870 sat in the State Senate. He was Attorney-General of Maine in 1870–72 and solicitor of the city of Portland in 1874–77. Elected as a Republican to Congress in 1876, he served for many consecutive years. In 1889 he was chosen Speaker of the House. Again in 1895 and in 1897 he was elected Speaker, but in 1899 he resigned his seat in Congress and entered upon the practice of law in New York City. As Speaker of the National House of Representatives, he made a notable innovation upon the parliamentary procedure of that body by adopting the practice of counting as present those members of the opposition who, though physically present, refused to vote in order to prevent a quorum. This innovation created a storm of opposition in the House and was denounced as revolutionary. His rulings, however, were adopted by the House in 1890. The practice was soon acquiesced in by the Democrats, and it became a permanent part of the procedure of the Lower House. Moreover, he developed an organized committee system, making the majority of the Committee on Rules consist of the Speaker and chairman of the committees on Ways and Means and Appropriations. In 1896 Reed was a prominent candidate for the Republican nomination for the presidency, but was defeated by William McKinley. After the war with Spain Reed broke with the administration on the issue of imperialism. He died at Washington Dec. 7, 1902. Reed was a remarkable personality, an able parliamentarian, and an efficient speaker, his addresses often being enlivened by rare wit and humor. He published *Reed's Rules* (1894) and edited with others a *Library of Modern Eloquence* (10 vols., 1901). Consult H. B. Fuller, *Speakers of the House* (Boston, 1909), and S. W. McCall, *Life of Thomas B. Reed* (Boston, 1914).

REED, Walter (1851–1902). An American army surgeon, sanitarian, and bacteriologist, born in Gloucester Co., Va., Sept. 13, 1851. He received his medical education at the University of Virginia and at University Medical College, New York (M.D., 1869). After gaining experience in several hospitals in New York and Brooklyn, he was appointed assistant surgeon in the army in 1875 and in 1890 was assigned to duty in Baltimore, where he remained a year. During this period he studied bacteriology under Prof. William H. Welch (q.v.) of Johns Hopkins. Appointed curator of the Army Medical Museum, Washington, in 1893, Reed established a laboratory where he gave instruction in bacteriology to the young officers studying in the newly established Army Medical School. In addition he did much original work in bacteriology and in the conduct of special sanitary inspections and investigations. In 1898 he was placed at the head of a board of which Dr. Victor C. Vaughan and Dr. Edward O. Shakespeare, of Philadelphia, were the other members, to investigate the epidemic occurrence of typhoid fever among the United States troops encamped, especially at Chickamauga, at the opening of the Spanish-American War. The report of the committee was of the highest interest and added much to the knowledge of the disease. In 1897 Reed, with Dr. James Carroll, demonstrated the fallacy of the claim of Sanarelli that the *Bacillus icteroides* was the causative agent of yellow fever, and in 1900 he went to Havana at the head of a commission to investigate the etiology of the same disease, the other members being Dr. James Carroll, Dr. Jesse W. Lazear, and Dr. Aristides Agramonte. He demonstrated that yellow fever is transmitted from man to man only by the bite of mosquitoes of a certain variety (*Stegomyia fasciata*, or *calopus*), which have become infected by previously biting persons sick of yellow fever. The work of this commission is remarkable for the accuracy and completeness of its experimental work, the devotion with which its members exposed themselves (two of them having submitted to experimental inoculations with infected mosquitoes), and for the far-reaching importance of their conclusions. In 1901, the investigation completed, Major Reed returned to Washington, where he became professor of bacteriology in the Army Medical School and of pathology and bacteriology at Columbian (later George Washington) University. Besides his work in yellow fever and typhoid, his investigations in erysipelas and cholera should be mentioned. Reed died Nov. 22, 1902, after an operation for appendicitis. In 1893 he had been promoted first on the list of majors of the Medical Department of the United States Army, and the Secretary of War had recommended to Congress his promotion by a special act to the rank of colonel. He was buried at Arlington. Congress granted to his widow a pension of $125 a month. Consult H. A. Kelley, *Walter Reed and Yellow Fever* (Garden City, N. Y., 1906), and W. D. McCaw, *Walter Reed: A Memoir* (Washington, 1907). See INSECTS, PROPAGATION OF DISEASE BY.

REED, WILLIAM BRADFORD (1806–76). An American politician and journalist, born in Philadelphia. After graduating at the University of Pennsylvania in 1825 he went to Mexico as private secretary of Joel R. Poinsett, studied law, was elected State Attorney-General (1838), was made professor of American history at the University of Pennsylvania (1850), in 1857 became Minister to China, where he negotiated the Treaty of June, 1858, and on his return (1860) was active in Democratic politics and in New York journalism. For a time he was American correspondent of the London *Times*. Reed published many controversial and historical pamphlets and contributed essays chiefly to the *American Quarterly* and the *North American Review*. He wrote also an excellent *Life and Correspondence of Joseph Reed*, his grandfather (1847), and *Life of Esther de Berdt*, afterward Esther Reed, his grandmother (1853).

REED′BIRD′. The name in the Middle States of the bobolink (q.v.). In England the name belongs to a warbler, the reed wren (*Acrocephalus streperus*), and to the reed bunting (q.v.).

REED′BUCK′, or **REITBOK**, rēt′bŏk′. A small goatlike antelope of central and southern Africa (*Cervicapra arundineum* or *Redunca redunca*), the males alone of which are provided with horns, which vary greatly in size and shape. It is never found far from water, is slow and unsuspicious, and hence is becoming rare. Consult Sclater and Thomas, *Book of Antelopes* (London, 1894–1900).

REED BUNTING, or SPARROW. A small dark-colored European finch (*Emberiza schœniclus*), fond of marshes and wet meadows, which is common throughout Europe and is frequently called black-headed bunting. See Plate of BUNTINGS AND GROSBEAKS.

REED′ER, ANDREW HORATIO (1807–64). The first Governor of Kansas Territory. He was born at Easton, Pa., was educated at Lawrenceville, N. J., studied law, and practiced with great success at Easton. He became influential in the Democratic party and in 1854 was appointed Governor of the new Kansas Territory by President Pierce. It was expected by those who had secured his appointment that he would assist in the work of making Kansas a slave State, but this, owing perhaps to the lawless behavior of the border ruffians from Missouri, he did not do, and instead became favorable to the Free-State party in the Territory. As a result of his attitude a delegation of Democrats, headed by Jefferson Davis, demanded his removal. With this demand the President complied, and Reeder was removed from office after a tenure of a little more than a year. He then became one of the leaders of the Free-State party, and in September, 1855, was nominated as delegate to Congress by the Big Springs convention. A little later he was again chosen delegate by the same party, but was never allowed to serve. In the following July he was elected United States Senator by the Legislature organized under the Topeka constitution, but as Kansas was not admitted to statehood, he was not permitted to take his seat. Not long afterward he returned to the East, and was received with great enthusiasm by the opponents of slavery. Upon the outbreak of the Civil War he was appointed a brigadier general, but felt himself too old and infirm to serve. Consult Charles Robinson, *The Kansas Conflict* (New York, 1892), and L. W. Spring, *Kansas* (Boston, 1892).

REED FISH. One of the two ganoid fishes (the other being the bichir, q.v.) which constitute the sole remaining representatives of the order Crossopterygii, which was of great importance in ancient times. This modern ganoid is a small fish dwelling in the rivers on the west coast of Africa, and has an elongated, terete body with a curiously divided dorsal fin and no pelvic fin. There is only one species (*Calmoichthys calibaricus*), which lives in deep pools and apparently buries itself in the mud at the bottom, where it feeds on fishes and other aquatic animals.

REED INSTRUMENTS. See REED.

REED MACE. A plant. See TYPHA.

REEDS′BURG. A city in Sauk Co., Wis., 51 miles by rail northwest of Madison, on the Chicago and Northwestern Railroad (Map: Wisconsin, D 5). It has a Carnegie library and a training school for teachers. Among the industrial establishments are a milk condensery, woolen, planing, and flour mills, machine shops, creameries, and a canning factory. Reedsburg is a large potato market, and ships also apples, live stock, and creamery products. Pop., 1900, 2225; 1910, 2615.

REEF (Dutch *rif;* probably connected with Icel. *rifa*, fissure, from *rīfa*, to split, Eng. *rive*). A barrier of rock or sand extending along the shore of an island or a continent. The most common type of a rock reef is that formed by coral organisms which flourish in the shallow portions of tropical seas. (See CORAL ISLAND AND CORAL REEF.) The sediment carried seaward by rivers and the sands beaten up by waves accumulate along the seashore as sand reefs, inclosing long, narrow lagoons. See BAR.

REEF. See SAIL.

REEL (AS. *rēol*, *hrēol*, Icel. *hræll*, *ræll*, Gael. *ruidhil*, weaver's reel). A lively, gliding dance whose origin is probably Celtic, though its resemblance to a Danish national dance has led many to ascribe it to Scandinavian sources. It is usually danced by two couples, but admits of a greater number. The music is in general written in eight-bar phrases in common time of four crotchets in a measure, but sometimes in jig time of six quavers. The principal characteristic of all reel figures is a circular movement during which the performers face each other and describe a series of figures of eight. The strathspey (q.v.) is merely a slow form of the reel.

REËNTRY. The act of entering into possession of lands in the exercise of a right expressly or impliedly reserved to a lessor or grantor in a lease, deed, or other conveyance upon condition. In order to take advantage of a right of reëntry, a person should first demand payment or compliance with the terms of the lease or conveyance, and upon a refusal or neglect to do so, enter peaceably, if he can, but otherwise he must proceed at law. Right of reentry may be waived by the person entitled to exercise the same, in which case the estate is unaffected by the breach of condition. See CONDITION; ENTRY; WAIVER.

REES, JOHN KROM (1851–1907). An American astronomer, born in New York City and educated there at Columbia (College and School of Mines). After teaching at Washington University, St. Louis (1876–81), he became instructor in geodesy and astronomy at Columbia (1881) and professor of astronomy (1892). He had witnessed the solar eclipse of 1878 at Fort Worth and published a report thereon; and in 1884 he published *Observations of the Transit of Venus, December 6, 1882.* He was a member of the American Meteorological Society and wrote on international time systems and on variation of latitude, especially that of New York City. In 1900 he was made Chevalier of the Legion of Honor in recognition of services as juror in the department of instruments of precision at the Paris Exposition. Professor Rees was intimately connected with L. M. Rutherfurd in work on celestial photography and was a delegate to the Astronomical Congress on Photography. He retired under the Carnegie Foundation in 1906.

REEVE. See RUFF; PHEASANT.

REEVE (AS. *gerēfa*, probably from *ge-*, generalizing prefix + **rōf*, OHG. *ruova*, Icel. *rōf*, number, or from *rōf*, famous, Goth. *hrōps*, OHG. *ruof*, Ger. *Ruf*, outcry, AS. *hrōpan*, to cry out). The name given in England, especially in Anglo-Saxon times, to various officials. The reeve was ordinarily the presiding officer of a district, and was known by his district, e.g., *tūngerēfa*, the reeve of the township; *scīrgerēfa*, the reeve of the shire (our modern sheriff). In later times the reeve is prominent in constitutional history, since he and four men from each township attended the great hundred courts held by the sheriffs twice a year. Furthermore, it was the reeve and four men from each township on the royal demesne who were summoned to the Council of St. Albans in 1213, this being the first instance in which the commons were represented at a Great Council. Consult William Stubbs, *Constitutional History of England*, vol. i (6th ed., Oxford, 1897).

REEVE, CLARA (1729–1807). An English novelist, daughter of William Reeve, a curate in Suffolk. Her writing was done at Colchester, Essex. In 1777 appeared *The Champion of Virtue: A Gothic Story,* reissued the next year with its title changed to *The Old English Baron.* This romance is of significance as a link between Horace Walpole's *Castle of Otranto* and the romances of Mrs. Ann Radcliffe (qq.v.). In criticism Miss Reeve published the *Progress of Romance* (1785), an account of contemporary fiction. Consult H. A. Beers, *History of English Romanticism in the Eighteenth Century* (New York, 1899).

REEVE, HENRY (1813–95). An English man of letters, born at Norwich and educated at Geneva and Munich. He traveled extensively and met the leading literary people of his day. From 1843 to 1887 he was registrar of the Privy Council and from 1855 until his death he was editor of the *Edinburgh Review.* He translated De Tocqueville's *Democracy in America* (1835–40) and Guizot's *Washington* (1840), edited Greville's *Journal of the Reigns of King George IV and William IV* (1874), and wrote *Royal and Republican France* (1872) and *Petrarch* (1878).

REEVE, RICHARD ANDREWS (1842–). A Canadian physician. He was born in Toronto and was educated at Toronto University and in medicine at Queen's University, Kingston. He was assistant surgeon of the Toronto Eye and Ear Infirmary in 1867–72 and later was lecturer on ophthalmology and otology in the medical faculty of Toronto University, of which he was dean from 1896 to 1908. He was elected president of the Canada Medical Association, and in 1907 was appointed head of the service, eye department, of Toronto General Hospital. In 1905 he was elected president of the British Medical Association, presiding at its meeting in Toronto in 1906. The next year he was elected a life vice president of the association.

REEVE, TAPPING (1744–1823). An American lawyer and jurist, born at Brook Haven, Suffolk Co., Long Island. He graduated at Princeton in 1763, was a tutor there from 1767 to 1770, and in 1772 established himself at Litchfield, Conn., in the practice of law. He was an ardent patriot during the Revolution, was a member of several important local committees of safety and defense, and served as a recruiting officer. Shortly after the close of the war he opened at Litchfield a law school, which for a number of years was the best-known and most successful institution of the sort in the country. This school he conducted alone until 1795, and then in association with James Gould until 1820. Some of the most celebrated members of the profession in America received their education there. Reeve was a strong Federalist, but except for brief terms in the Connecticut Legislature and council, his services were all of a judicial nature. In 1798 he was elected a judge of the Connecticut Supreme Court, and remained on the bench for 16 years, becoming Chief Justice shortly before his retirement in 1814. His publications include *The Law of Baron and Femme; of Parent and Child; of Guardian and Ward; of Master and Servant, etc.* (1816; since republished in many editions) and *A Treatise on the Law of Descent* (1825).

REEVES, rēvz, Arthur Middleton (1856–91). An American philologist and historian, born at Cincinnati, Ohio. He graduated in 1878 from Cornell University, where he devoted himself to the study of languages, especially Old Norse and the sagas. In 1879 he traveled in Iceland, studying Icelandic, Old Norse, the sagas, and ancient manuscripts, and thereafter till 1890 he spent much time in Europe in scholarly investigation. He was killed in a railroad accident. Reeves wrote *The Finding of Wineland the Good* (1890; new ed., 1895), with phototype plates of the vellum manuscripts of the sagas and biography and correspondence of the author, an important work on the discovery of America. With N. L. Beamish and R. B. Anderson he wrote *The Norse Discovery of America* (posthumous, 1906).

REEVES, Mrs. Henry (Helen Buckingham Mathers) (1853–). An English novelist, born at Misterton, Somersetshire. She was educated at Chantry School, near Frome. In 1876 Miss Mathers married Henry Albert Reeves, a London orthopædic surgeon (died 1914). Her first novel, *Comin' thro' the Rye* (1875), gained wide attention. It was followed by the popular *Cherry Ripe* (1877), *My Lady Green Sleeves* (1879), and several others, including novelettes, *The Land o' the Leal* (1878) and *As he Comes up the Stair* (1878). Among her later novels are: *A Man of To-Day* (1894); *The Lovely Malincourt* (1895); *The Sin of Hagar* (1896); *Bam Wildfire* (1898); *Becky* (1900); *Tally Ho!* (1906); *Pigskin and Petticoat* (1907); *Love the Thief* (1909).

REEVES, John Sims (1822–1900). An English tenor, born at Woolwich. He studied under J. B. Cramer, T. Cooke, and other noted artists and appeared in public as an operatic barytone at Newcastle in 1839. After further study in Paris he appeared at Milan in the tenor part of Edgardo in *Lucia di Lammermoor*, when his singing electrified the audience. At Drury Lane in 1847 he was immediately recognized as the foremost living English tenor and was engaged in 1848 at Her Majesty's Theatre. In 1851 he was equally successful as first tenor at the Italian opera in Paris. He retired from the stage and became a professor in the Guildhall School of Music in 1892, but on account of financial reverses returned to the concert platform and in 1896 made a successful tour in South Africa. He wrote *On the Art of Singing* (1900).

REEVES, William Pember (1857–). A British economist, born in Canterbury, New Zealand. He was educated at Christchurch, New Zealand, studied law, but, abandoning this profession for journalism, became editor of the Canterbury *Times* and later of the Lyttelton *Times.* He was a member of the New Zealand Parliament in 1887–96 and Minister of Education, Labor, and Justice in 1891–96. From 1896 to 1905 he was Agent General of New Zealand and then for four years High Commissioner. In 1908 he became director of the London School of Economics. Reeves's activity in the politics of New Zealand gave particular value to his books, *The Long White Cloud: A History of New Zealand* (1898; 2d ed., 1900) and *State Experiments in Australia and New Zealand* (1902), and to his contributions to Kennedy's *Story of the Empire* (1897) and Ashley's *British Dominions* (1911). In verse he wrote *New Zealand and Other Poems* (1898) and *In Double Harness* (1891), with G. P. Williams.

REF'ERENCE, REF'EREE' (from Lat. *referre*, to refer, bear back, from *re-*, back again, anew + *ferre*, to bear, carry). In law, reference is the sending of issues or questions arising in a legal proceeding to a competent attorney as referee, to be tried or examined by him in the place and stead of a judge and jury. A reference may be voluntary or compulsory. It has been held in many of the United States that in certain cases compulsory references are constitutional. Actions involving long and complicated accounts and divorce actions, where privacy and secrecy are deemed desirable in the public interest, are those most frequently tried before referees. Referees are usually appointed only as the occasion arises, but under the United States Bankruptcy Act standing referees are appointed by the courts. The findings of a referee are submitted in a report which is filed with the court ordering the reference, and on its confirmation by that court a judgment may be entered in accordance with the decision of the referee. This judgment may be reviewed on appeal by an appellate court. The fees and expenses of a reference are usually large, and on that ground litigants frequently oppose a motion to send a case to a referee. Referees correspond to masters in chancery, appointed by courts of equity, but in code States referees hear both legal and equitable actions. See Arbitration; Court; Trial.

REF'EREN'DUM (Neo-Lat. nom. sing. neut. of Lat. *referendus*, to be referred, gerundive of *referre*, to refer, bear back). The term applied to the practice of submitting laws to the electorate for approval or rejection. In the application of the referendum the law is first formulated by the legislative body or the constituent assembly and is then submitted to the electorate. The logical complement of the referendum is the initiative, by means of which the people are enabled to draw up their own measures and have them voted on without the intermediation of the Legislature. By this method a petition signed by a certain proportion of the voting constituency is presented to the Legislature requesting that a certain measure be submitted to the popular vote. This the Legislature is bound to do without change in the measure, although it may submit an alternative measure to be voted on at the same time. In Switzerland, in every canton of the Confederation except Fribourg, the referendum in one form or another is established by law. In about one-half of the cantons the referendum is optional or facultative, i.e., the laws are submitted to the popular vote only when submission by petition of a certain per cent of the voting constituency is demanded. In the others it is obligatory, i.e., the laws must be submitted without petition. It is always obligatory in the case of proposed constitutional changes, whether cantonal or federal. In the domain of ordinary legislation it is usually employed only in the case of important measures of a general character. Since 1874 the referendum has been a feature of the government of the Confederation. The constitution provides that upon the demand of eight cantons or 30,000 citizens any federal law of general application must be submitted to the people. During the first 19 years after its adoption by the federal government 20 laws out of a total of 150 were thus submitted, 14 being ratified and 6 rejected. The initiative was adopted by the federal government in 1891 as a means of introducing proposals to revise the constitution. See SWITZERLAND, *Government*.

In the United States the referendum is employed in one form or another in every State and municipality. Early in the country's history it became an established principle of American law that all State constitutions and proposed amendments should depend for their validity upon the ratification of the electorate at the polls. From this it was but a step to the position that propositions to call constitutional conventions should be made a subject for the referendum, and this practice became in time well established. Not only has the referendum been employed in the United States for the adoption of organic laws, but it has been used quite as often or more often in the enactment of statutes. It was first employed to determine the question of incorporation of towns, the organization of school districts and counties, the incurring of loans, the undertaking of public improvements, etc. The referendum has never been employed by the Federal government for general purposes, although an Act of Congress of 1846 providing for a recession of a part of the District of Columbia to Virginia was submitted to a vote of the qualified voters of the District.

The question early arose as to whether the use of the referendum was permissible where not expressly authorized by the State constitution. From 1826 to 1847 the courts of various States upheld the constitutionality of legislative acts providing for the use of the referendum on the ground that it was not a delegation of legislative power, but simply popular coöperation. Beginning with a decision of the Delaware Supreme Court in 1847, several opinions were given against this view which had the effect of inducing the incorporation of provisions in the constitutions authorizing the referendum. As an instrument of ordinary legislation the referendum in America dates from the South Dakota Law of 1898. Between 1898 and 1913, 15 additional States, chiefly in the Middle and Far West, incorporated the referendum into their lawmaking process. See ELECTION; ELECTORAL REFORM; INITIATIVE; LEGISLATION; POPULAR GOVERNMENT; PRIMARY ELECTION; RECALL.

Bibliography. W. B. Munro (ed.), *Initiative, Referendum, and Recall* (New York, 1912); Boyle, *The Initiative and Referendum* (Columbus, 1912); Beard and Schultz, *Documents on the State-Wide Initiative, Referendum, and Recall* (New York, 1912); E. P. Oberholtzer, *The Referendum in America* (ib., 1912); W. H. Taft, *Popular Government: Its Essence, its Permanence, and its Perils* (New Haven, 1913); E. M. Phelps (comp.), *Selected Articles on Initiative and Referendum* (3d ed., White Plains, N. Y., 1914).

REFINEMENTS OF ARCHITECTURE. In the year 1814 the architect Allason, studying the ruins of the Parthenon (q.v.) at Athens, for the first time observed that the arrises or edges between the channelings of the columns described each a delicate convex curve and that the tops of the stylobate steps were not perfectly horizontal but slightly convex upward. These observations were confirmed later by Cockerell and Haller, verified by C. F. Penrose in 1846, and were extended and developed by him, by Ziller, and by others. It was discovered that the Parthenon columns leaned inward and were separated by subtly varied spacings and that friezes and corona facias leaned slightly outward. It was observed also that the cornices surrounding the forecourt of the temple of Medînet Habu in Egypt all described delicate curves with the convex inward. Similar curves and leans having been verified in other Greek buildings, it was evident that they were made intentionally; and various theories were propounded to account for such careful deviations from mechanical straightness, verticality, and regularity. The more commonly adopted theories were that they were intended to correct an apparent concavity in long straight lines; that they counteracted certain optical illusions; that they gave vitality and vigor to designs which if too mechanically perfect would appear cold and hard.

In 1874 W. H. Goodyear first published in *Scribner's Monthly* an account of his observations of certain puzzling irregularities in the lines of Pisa Cathedral and his conviction that they were intentional and not accidental. Since that date, in numerous expeditions to Europe, several of these being made in behalf of the Brooklyn Institute of Arts and Sciences, Mr. Goodyear has accumulated a vast array of data relating both to classic monuments and to those of the Middle Ages, especially in Italy and France, tending to show that the Greek tradition survived in various modified forms until at least the sixteenth century, and that innumerable singular curves, leans, and other deviations from mechanical regularity, previously unobserved or attributed to accident, settlings, or careless execution, were intentional and purposeful. Mr. Goodyear's conclusions, hotly contested by not a few able architects and archæologists, have been widely accepted, nevertheless, and to their support an immense mass of evidence by photographs, supplemented by careful measurements, has been presented to the public. The most important phenomena thus established are:

1. Bends or curves in plan.
2. Widenings in the nave eastward.
3. Pitch or slope in the pavement.
4. Convexity upward of lines normally horizontal.
5. Curvature of vertical lines.
6. Widening upward of the nave, the opposite vaulting shafts leaning apart, either in delicate curves or in straight lines.
7. Variations in spacing and dimensions of apparently similar features—arches, piers, etc.
8. Forward leaning of façades.

The general explanation offered for these irregularities and refinements is that some (e.g., 2, 3, 6, 8) were designed to correct or to enhance perspective effects or illusions; others (e.g., 1, 4, 5, 7) to avoid the deadness of mechanical regularity; while 1 may possibly have had also some symbolical value.

In consequence of these observations occasional efforts have been made in modern work to introduce similar refinements, as in certain leans in the cathedral of St. John the Divine in New York and upward convexity in the long steps of the south court of Columbia University. The subject deserves far more careful study by practicing architects than it has generally received. Consult: W. H. Goodyear, "Recently Published Measurements of the Pisan Cathedral," in *American Journal of Archæology*, second series, vol. xiv (Baltimore, 1910); id., "Mediæval Architectural Refinements," in *Yale Review* (New Haven, 1912); id., *Greek Refinements* (ib., 1912); various memoirs of the Brooklyn Institute Museum (Brooklyn, N. Y., 1902 et seq.); also F. C. Penrose, *Investigation of the Principles of Athenian Architecture* (London, 1857).

REFINING OF METALS (from Lat. *re-*, back again, anew + Eng. *fine*, from OF. *fin*, probably from Lat. *finitus*, finished, p.p. of *finire*, to bound, limit, from *finis*, boundary). The process is essentially the increasing of the purity of metal which has already been put into bullion or other alloyed form. Refining does not necessarily have as its immediate object the obtaining of the metal in an absolutely pure state. In many cases a refining process is carried out on the base bullion produced at ore-reduction works, the result being a richer bullion which may be further treated at special refining plants. The expression "refining" is used particularly with reference to silver and gold, often referring to the separating or parting of the two metals in bullion containing only silver and gold. The pure metals obtained are known as fine silver and fine gold. Refining in the metallurgy of iron is commonly understood to mean the partial decarburization and purification of pig in the open-hearth furnace. See COPPER; GOLD; IRON AND STEEL; LEAD; NICKEL; SILVER; TIN.

REFLECTING ANEMOMETER. See NEPHOSCOPE.

REFLEC'TION (Lat. *reflexio*, a bending back, from *reflectere*, to bend back, from *re-*, back again, anew + *flectere*, to bend). A general phenomenon observed in the case of all kinds of wave motion. If there are two media separated by a bounding surface, in which the trains of waves of the particular kind have different velocities, waves traveling in one medium and meeting this bounding surface will suffer reflection, either total or partial. This is illustrated in aërial waves by the phenomenon of echoes and in ether waves by the common use of mirrors of various kinds. The laws of regular reflection are that the incident and reflected rays make equal angles with the line drawn perpendicular to the surface of the point of incidence and that the two rays and this line lie in a plane. (See LIGHT.) To reflect a train of waves the reflecting body must have a size larger than the wave length of the waves; a pile rising above the surface of a lake may reflect ripples, but long waves pass around it; a pane of window glass will reflect aërial waves characteristic of a shrill sound and allow others to pass; a small particle of matter floating in the air may reflect such short ether waves as produce the sensation of blue light, but allow to pass those so long as to produce red. If the bounding surface between the two media is rough, i.e., has inequalities which are comparable with the lengths of the waves, they will be scattered by these and will be diffusely reflected, e.g., ground-glass surfaces.

REFLECTOSCOPE. See PROJECTION APPARATUS.

REFOR'ESTA'TION. See FORESTRY.

REF'ORMA'TION (Lat. *reformatio*, from *reformare*, to form anew, from *re-*, back again, anew + *formare*, to form, from *forma*, shape). In law, the rectification or amendment of contracts or other legal instruments pursuant to the judgment or decree of a court of equity. If a term is incorporated into a written instrument by mistake so that it does not represent the real intention of the parties, such intention, by reason of the parol-evidence rule (see EVIDENCE), cannot be shown in any proceeding at law founded upon the written instrument. Courts of equity, however, will give relief from the consequences of such a mistake by compelling the cancellation and surrender of the written instrument and the execution of a new instrument to conform to the actual intention of the parties. The ordinary rules governing equitable proceedings apply in proceedings to reform written instruments; and the court will give such incidental relief as is necessary to carry out the main purposes of the proceeding. See CONTRACT; EQUITY; EVIDENCE; MISTAKE; RESCISSION.

REFORMATION, THE PROTESTANT. By this term is designated the great revolution which took place in the sixteenth century against certain doctrines and practices of the Roman Catholic church. Though primarily a religious revolution which attacked the universal supremacy of the Pope and ended religious unity in Christendom, it was also accompanied by changes in the political, social, and intellectual conditions of western Europe. Like the Renaissance (q.v.), which preceded it, and the French Revolution, which followed it, the Protestant Reformation was one of the three great revolutionary waves of the advancing tide of modern civilization. Though it is more accurately designated the Protestant Revolution, its leaders were often called reformers and it led to definite reforms within the Catholic church; it is therefore convenient to accept the long-established usage of speaking of the Protestant Reformation rather than of the Protestant Revolution. It is considered below under six headings: (1) Conditions Preceding the Reformation out of which the movement developed; (2) Lutheran Reformation in Germany and Scandinavia; (3) Calvinistic Reformation in Switzerland, France, Holland, and Scotland; (4) Reformation in England; (5) Minor Sects; (6) General Results of the Reformation.

Conditions Preceding the Reformation. The Reformation dates from the year 1517, when Martin Luther (q.v.) challenged some of the papal assertions in his famous *Ninety-five Theses*. The *Theses* spread like wildfire. Luther tells us that the printing presses could not meet the demands for them. The explanation of their popularity can be understood only by noting certain conditions which had long existed in Europe and which in the beginning of the sixteenth century combined to produce the Protestant Revolution.

An almost continual conflict, since the time when the Empire was revived by Otto I (q.v.) in the year 962, had been taking place between popes and emperors. This conflict had generally resulted in victory for the papal side, but created a bitter antagonism between Rome in the south and Germany in the north. To this antagonism were added in the fourteenth and fifteenth centuries the beginnings of that spirit of nationality which has grown steadily and powerfully as a source of discord between peoples, until in the twentieth century it became one of the main causes of the World War of 1914. The national resentment against papal officials, papal taxation, and papal interference began to show itself in one country after another. In England the statutes of Mortmain (1279), of Provisors (1351), and of Præmunire (1393) greatly reduced the power of the Church to withdraw land from the control of the civil government, to make appointments to ecclesiastical offices, and to exercise judicial authority. John Wiclif (1324–84) boldly attacked the papacy itself, striking at the practices of indulgences, pilgrimages, and the worship of saints, as well as at the fundamental doctrine of transubstantiation. He denounced the teaching and character of the ordained priests and advocated in their stead "simple priests" living according to the Gospels. To reach the common people and to foster a higher spiritual life among them, he translated the Bible and prepared sermons in English. Wiclif's teachings, carried by wandering students according to mediæval fashion from one university to another and transported in other ways, spread into Bohemia. Here they found a powerful advocate in John Huss (1369–1415). Huss was arrested, condemned at the Council of Constance, delivered over to the secular arm, and burned at the stake. His death, however, did not silence his protest. On the contrary it raised a religious and social national revolt in Bohemia which was a direct precursor of the revolt in Germany in Luther's day. It was not suppressed until the Pope was forced to make concessions to the Hussites. Wiclif and Huss were forerunners of Luther.

The papacy itself in the fourteenth and fifteenth centuries had in some cases fallen in practice from the high ideals of Gregory VII and Innocent III. It had become an object of easy attack on account of the greed, immorality, and ignorance of numbers of its officials all through the hierarchy. Though there were unquestionably a great many good pastors and faithful monks, there is evidence from churchmen themselves that too many of their own number lived lives which were a cause of scandal and indignation to simple and devout Christians. The "Babylonian captivity" of the papacy at Avignon (1305–76) had increased the luxury and expenses of the papal court and consequently increased the pressure of ecclesiastical taxation, the sale of offices, papal tithes, annates, and other forms of financial exaction. This ecclesiastical taxation was resented by both the governments and the common people of the growing nations north of the Alps. The Great Schism (1378–1417), with the spectacle of three antipopes vituperating one another, not only scandalized Europe, but divided the faithful into partisans of one or the other Pope. The Church itself had recognized all these evils and had proposed at the Council of Constance its own "reformation in head and members." But no thorough reform was accomplished at that time.

The revival of learning in Italy, which was one of the phases of the Renaissance (q.v.), struck down the scholastic system of the mediæval Church and deprived churchmen of that monopoly of learning which they had so long enjoyed. The schools of Vittorino da Feltre and Guarino da Verona, the newly discovered art of printing with movable metal types, and the revival of the classic literatures of Greece and Rome put into the hands of others than Church officials the long unknown stores of human knowledge and the tools for textual criticism. Lorenzo Valla (1406–56) endeavored to prove that the Donation of Constantine, as well as many other documents on which papal claims rested, were forgeries. The Italian humanists, however, seduced by the beauty of the ancient pagan world and the pleasures of Epicurean philosophy, were generally indifferent to reform in the Church. Genuine and effective desire for reform came first from the humanists of the North—Desiderius Erasmus (1466–1536) of Rotterdam, John Colet (1466–1519) and Sir Thomas More (1478–1535) in England, Lefèvre d'Etaples in France, and John Reuchlin (1455–1522) in Germany. These earnest Christians employed the New Learning towards a reform in morals and a more accurate knowledge of the Scriptures. By their scholarly study of the text of the Bible, which was greatly furthered by Erasmus' Greek edition of the New Testament (1516) and by Reuchlin's Hebrew studies on the Old Testament, they laid the foundation on which Luther and Calvin could take their stand when they appealed to the Bible as the source of all authority.

Finally, a revival of interest in religion and an increase of genuine piety in the family life of the common people are noticeable in Germany in the latter decades of the fifteenth century. This found expression in the passion for collecting relics, in the numerous pilgrimages, and in the more frequent sermons, church festivals, and miracle plays. The religious revival found expression also in a silent, sincere, nonecclesiastical religion which is evidenced by the study of the Bible, by the publication of devotional works, and by the formation of devout groups of men and women for study and prayer, such as the Brethren of the Common Life. These German Mystics aimed at the closest union between man and God. Their earlier leaders were Master Eckhart (died 1327), Heinrich Suso (died 1366), Johann Tauler (died 1361), and Thomas à Kempis (died 1471), the famous author of the *Imitation of Christ.* In contrast with humanistic Italy, where the reform movement of Savonarola (q.v.) collapsed completely, it is noteworthy that in Germany the earliest presses printed many more books for family and private devotion and many more editions of the Bible than of the Greek and Roman classics —22 editions of the Psalter in German before 1509, 25 of the Gospels and Epistles before 1518, and 14 versions of the whole Bible in High German and 3 in Low German; these versions, however, were from the Vulgate and were lacking in accuracy and literary merit; they were consequently superseded completely by Luther's masterly translation a few years later.

Lutheran Reformation in Germany and Scandinavia. *Germany.*—The Protestant revolution began in Germany with Martin Luther

(1483–1546) and was considerably influenced by his strong personality. He in turn was the embodiment and exponent of many of the tendencies inherent in the conditions preceding the Reformation. He was a patriotic German, who hated to see Germany drained of her money for the support of foreign Italian officials. On a visit to Rome in 1511 he had seen the worldliness, corruption, and vices into which some of the Renaissance popes had sunk. Though the shock which he then received did not at once convert him into a reformer, it gave great strength and point to his later assault on the papacy. At the University of Erfurt he caught something of the New Learning, and later enjoyed the friendship and assistance of the greatest German scholars, like Melanchthon and Reuchlin. His sensitive nature was deeply impressed with the simple piety of his peasant parents and early surroundings. Overwhelmed by a profound conviction of sin and fear of hell, for 10 long years he struggled to win salvation for himself by his own good works. Gradually, from reading the writings of the German Mystics, and especially from St. Paul's Epistles, he came to believe that salvation, or "justification," could not be won by man's own efforts, but was the free gift of God, to be gained only by faith. "A man is justified by faith apart from the works of the law," said St. Paul (Rom. iii. 28). So justification by faith became the doctrinal starting point of Luther's career and the basis from which he soon attacked the various good works, such as indulgences, recommended by the Church. Besides embodying many of the tendencies of the time, Luther was born and remained a man of the common people; he was therefore able to carry a strong popular movement to success, where earlier reformers had failed.

In 1517 a Dominican monk, named Tetzel (q.v.), came preaching indulgences to Luther's own parishioners near Wittenberg on the Elbe in Saxony. Luther was convinced that this was injurious to the moral and religious life of his fellow townsmen and that Tetzel's sermons as reported to him were full of lies and blasphemies. Therefore on All Saints' eve (Oct. 31), 1517, he posted on the door of the Castle Church at Wittenberg 95 theses challenging the theory and practice of indulgences. At once he found himself a storm centre. By many of the German princes and people he was applauded. By the Roman church he was summoned to submit to authority and be silent. A disputation at Leipzig (1519) with the zealous John Eck revealed the fact that Luther approved some of the doctrines of Huss, who had been condemned and burned as a heretic a century before. Accordingly the Pope issued against Luther a bull of excommunication. When it arrived at Wittenberg Luther, surrounded by the students and professors of the university, marched to a neighboring meadow and cast into a bonfire not only the papal bull itself but also a copy of the Canon Law (Dec. 10, 1520), thus symbolically breaking with the whole system upon which the Roman structure rested. The next year he was summoned before the newly elected German Emperor, Charles V, and the German princes and ecclesiastics assembled in the Diet at Worms (April, 1521). Here he was ordered to recant. Upon his refusal he was declared by Imperial edict to be an outlaw under the ban of the Empire, his writings were prohibited, and his adherents were threatened with extermination, but the edict was never completely enforced. Even the Papal Nuncio, Aleander, wrote that nine-tenths of the Germans cried "Long live Luther" and the other tenth "Death to Rome." After remaining hidden some months with friends at the Wartburg Castle, where he made an accurate and vigorous German translation of the New Testament from the original version in Greek, Luther came forth again to Wittenberg to assume the leadership of the reform movement which bears his name. Henceforth Germany was sharply divided religiously between Catholics and Lutherans. The former were supported by the Emperor, the bishops and abbots, and some of the princes. The latter found adherents in many of the free imperial cities and among the princes of northern Germany. In 1526, at the First Diet of Spires, it was agreed that German princes might adopt Lutheran practices, but at the Second Diet of Spires, in 1529, the Catholic majority rescinded this agreement. The Lutheran minority thereupon protested; thus the first Protestants were Lutherans, but the term was later broadened to include all the new Christian sects which arose out of the revolt from Rome. In 1530, at a diet in Augsburg, the Lutherans drew up a conciliatory statement of their tenets, known as the Augsburg Confession, with the hope that it would prove acceptable to the Emperor and the Catholic party. It was rejected by them, but it remained the basis of the new Lutheran church and creed. Charles V's wars with France and the Turks prevented him from attempting to suppress the Lutherans at once. But after Luther's death in 1546, with the aid of the ambitious Maurice of Saxony, the Emperor took the field against the Lutherans in the so-called Schmalkald War. Though successful at first, he finally had to flee for his life, owing to the treacherous desertion of Maurice of Saxony. The civil religious war was closed by the Peace of Augsburg in 1555. According to its terms each ruler in Germany might choose between either Catholicism or Lutheranism for his territory and might enforce his chosen faith upon all his subjects according to the principle *cujus regio, ejus religio.* This gave toleration to the princes, but not to the people. Lutheranism was at last legally recognized. The idea of the religious unity of Western Christendom under the headship of the Pope was forever abandoned. Lutheranism established itself in northern and northeastern Germany; Catholicism maintained itself in the southeast and along parts of the Rhine valley where strong bishoprics were situated. The Peace of Augsburg also allowed Lutherans to retain all episcopal and monastic lands which they had seized and secularized before 1552, but provided, by the ecclesiastical-reservation clause, that in the future any bishop or abbot who changed his faith should thereby forfeit his office and lands; these were to be reserved for loyal Catholics. In the half century after 1555, during the Catholic reaction, or Counter-reformation (q.v.), many disputes unfortunately arose in regard to the Peace of Augsburg; Catholics and Lutherans differed as to the observance of the ecclesiastical reservation; adherents of the Calvinistic Reformation (see below) demanded for themselves the same legal recognition which the treaty had accorded to Lutherans; and the Emperor was too weak to enforce the authority of the central government and thereby maintain peace between the religious factions. Out of these conditions came the Thirty Years' War (1618–48), which wrought terrible desolation in Germany until the religious and political questions were finally settled at the Peace of Westphalia (1648).

In the organization of the Lutheran church in Germany the territorial prince became the ecclesiastical head, *summus episcopus*, within his territory, so that there were as many Lutheran church organizations in Germany as there were Lutheran ruling princes. All, however, had virtually the same creed, based on the Confession of Augsburg. Each prince usually exercised his ecclesiastical power of appointment and discipline through a commission or consistory. In general Luther retained all the Roman Catholic service and practices which he did not consider inconsistent with the Bible. Of the seven sacraments he retained only two, baptism and the Lord's Supper. While denying the Roman Catholic doctrine of transubstantiation, Luther did vigorously insist on the literal meaning of the words *Hoc est corpus meum*, and maintained the Real Presence of Christ's body in the bread. Laymen partook of the Lord's Supper in both the bread and the wine. The church services were in the vernacular instead of in Latin, and an increased emphasis was placed on sermons and congregational hymn singing. In general attitude of mind the Lutherans tended towards conservatism. They hated the newer sect of Calvinists as dangerous innovators and contemners of the true meaning of the Lord's Supper and as restless political spirits who would involve Germany in revolutions and foreign religious wars.

Scandinavia.—The Lutheran Reformation in its essential features spread rapidly from Germany northward into the Scandinavian lands. It was carried by men who had studied under Luther at Wittenberg or who had been influenced by his writings. A national assembly which met at Copenhagen in 1536 did away with all episcopal authority in Norway and Denmark and invited Luther's friend, Bugenhagen, to come and organize a national Lutheran church on the basis of the Augsburg Confession. In Sweden, as a result of the efforts of the brothers Olaus and Laurentius Petri, a similar Lutheran Reformation was accomplished by the Ordinances Vesteräs, adopted by the Swedish Diet in 1527.

Calvinistic Reformation in Switzerland, France, Holland, and Scotland. Outside Germany and Scandinavia the dominating figure in the Reformation was John Calvin (1509–64), who lived a generation later than Luther. Calvin's systematic theology, his *Institutes*, his influence as an educator, and his ability as an organizer, unrivaled among the other reformers, brought it about that the Reformed church, as Protestantism was called in Switzerland, France, and Scotland, received a thoroughly Calvinistic stamp, both in its theology and in its organization. In each of these countries, however, some reform movement had begun before the influence of Calvin was felt.

Switzerland.—In Switzerland Ulrich Zwingli (1484–1531), a contemporary of Luther, was, like him, a peasant's son and a patriot, but he was somewhat better educated, more of a humanist, and of a wider and more statesmanlike outlook. His discontent with the Roman church came, not through the overwhelming conviction of personal sin and the need of salvation by faith, but from his study of the classics and of the Greek New Testament. He too, like Luther, had seen the corrupt conditions in Italy, where he had accompanied the Swiss mercenaries as army chaplain. Though at first he took a papal pension to recruit Swiss troops for the papal cause, he later denounced the whole mercenary system as prejudicial to the morals, patriotism, and peace of the Swiss nation. After completing his studies at Vienna and Basel he became a parish priest and settled near the famous monastery of Einsiedeln, a centre of pilgrimages. In 1519 he was called to an influential position as preacher in the cathedral at Zurich, and there his great work as a reformer began. At the approach of an indulgence preacher, named Samson, Zwingli denounced indulgences so vigorously that the Pope deemed it wise to recall Samson. Zwingli soon rose to a leading position in Zurich by his sermons in the cathedral, by his talks with persons in the market place, and especially by his public disputations before the town council. In these he took his stand upon the Bible as the source of authority and wished to do away with everything in the Catholic system except what Scripture enjoined. In 1523 and the two following years, under his leadership, the shrines were opened and the relics burned; religious processions and the images of saints were abolished; priests and monks were relieved from the vow of celibacy; and a simple communion service was introduced in place of the Mass. These changes by which Zurich withdrew from the Catholic church were accomplished legally and quietly by votes of the Zurich town council. Some other towns, such as Basel and Bern, followed Zurich's example. But the original forest cantons were more conservative and adhered to Catholicism. In Switzerland, as in Germany, the authority of the central government was too weak to enforce uniformity and prevent civil war. Two short civil conflicts took place between the Protestant and Catholic cantons, and Zwingli fell on the field of battle at Cappel in 1531. Soon after this Calvin's doctrines and organization took root in Bern and the other Protestant cantons. Switzerland ever since has been part Reformed and part Catholic.

In France the way of the Reformation had been prepared by a group of pious men, half mystic and half humanistic, who had gathered at Meaux, near Paris. Their leader, Lefèvre d'Etaples (c.1455–1536), published in 1512 a scholarly Latin edition, with commentary, of St. Paul's Epistles. Like Luther, his study of St. Paul had brought him to a belief in justification by faith and to a denial of the doctrine of transubstantiation. In 1523 he translated the whole New Testament into French. His work was at first favored by the Bishop of Meaux and especially by the King's sister, Margaret of Angoulême. But as Luther's doctrines began to spread in France greater attention was paid to the similar doctrines of Lefèvre. He and his followers were denounced by the Catholic faculty of the University of Paris and were soon persecuted by the King, Francis I, who hated dangerous innovations and felt personally insulted because some one had had the effrontery to post a Protestant placard on the door of the royal bedroom. Many leading Protestants fled from France to escape persecution and settled in Geneva or Switzerland until strengthened by the Calvinistic reformation at Geneva.

John Calvin (q.v.) was born at Noyon in Picardy in 1509. He received an excellent training in theology with his uncle, who was a bishop, a systematic training in Roman law at the University of Orleans, and a wide knowledge of the classics from his own natural inclination towards humanism and the New Learning. It was this threefold training as theologian, jurist, and scholar, combined with an inborn intellectual ability of extraordinary power, which gave his writing and teaching their unique force. Having written for the rector of the University of Paris a famous inaugural address, which the rector delivered but which was regarded as tainted with Lutheran heresy, both Calvin and the rector had to flee from Paris to escape the persecution of the French King. Calvin retired to Basel and published there, at the age of 27, the *Institutes of the Christian Religion.* It contains the fundamental ideas which he put into practice at Geneva and which are the basis of the Calvinistic Reformation in other countries. Geneva was a French-speaking town dependent on Savoy until shortly before Calvin's arrival in 1536, when it became independent, with the government in the hands of a town council. Some reform measures had already been accomplished under Farel and Froment. Calvin insisted on more. The Lord's Supper must be celebrated at least once every month. Congregational singing of the Psalms must be part of the church worship. Children must be taught a catechism and confession of faith. Especially a strict discipline and supervision of morals must be exercised by the pastors and members of the church, and notorious sinners must be excommunicated and forbidden to approach the Holy Communion. This strict régime, which insisted on the observance of the Ten Commandments, aroused the opposition of the pleasure-loving Genevese. Farel and Calvin were forbidden to preach further (April, 1538), and were finally exiled from the city. But three years later, Calvin's friends again having gotten control of the government, he was recalled in triumph and spent the rest of his life (1541–64) in making Geneva what John Knox called the "most perfect school of Christ since the Apostles."

Calvin's theology rests on the underlying belief in the absolute sovereignty of God as the personal ruler of the universe and in the Bible as the sole and sufficient source of authority. But he interpreted the Bible "with reason and equity" in a more liberal and scholarly spirit than did Luther. Calvin believed in "double predestination"—that the "elect" formed an "invisible church" predestined by God for salvation while the rest of mankind, tainted with original sin through Adam's fall, was predestined with equal certainty to damnation. He did not, however, give this doctrine the prominence which has been given to it by later generations. Calvin's organization of his church was democratic and furthered the idea of representative government. Church officials—pastors, teachers, presbyters, and deacons—were elected, like civil officials, by members of the church. Church and state were separate in organization, but coöperated closely to support each other. Calvin drew up a definite creed, which was made compulsory on all citizens who wished to exercise political rights, and a catechism which was taught to children. All citizens were to have at least a common-school education so that they could read and understand the Bible for themselves. In 1559 Calvin founded a university at Geneva, soon famous as a place for training proficient pastors and teachers. To enforce discipline of morals Calvin made efficient a rigid inspection of household conduct, and organized a consistory, composed of pastors and laymen, with wide powers of compulsion. Dancing, card playing, dice, and other recreations were forbidden; blasphemy and ribaldry were severely punished; even the dress and demeanor of citizens were prescribed down to minute details. In this severe Genevan atmosphere were formed the men of strong moral fibre and unflinching temper who went forth into Switzerland, France, Holland, Scotland, and even Germany, taking with them the Calvinistic system and spirit.

France.—To France before 1567 there had come from Geneva 120 pastors trained by Calvin. In 1559 delegates from 66 Protestant churches in France met at Paris in a national synod. This synod drew up a confession of faith and a book of discipline based on those at Geneva. Thus was organized the first national Protestant church in France. Its members were hereafter commonly known as Huguenots, probably a corruption of Eidgenossen, the name of the Confederates of Switzerland and Geneva from whom the French drew so much of their religious thought and organization. Unfortunately the Huguenot cause in France became involved in the rivalries of political factions. Nobles often joined or deserted the Huguenot ranks from political interest rather than from religious conviction. These political factions, combined with religious hatreds, led to a generation of civil wars (1562–98), broken by a few truces and darkened by the treacherous and terrible Massacre of St. Bartholomew (q.v.) in 1572, in which many thousands of Protestants, including their heroic leader, Gaspard de Coligny, perished. Under Henry IV (1589–1610), King of Navarre and France, the Huguenots triumphed for a moment at the battle of Ivry. But Paris and more than nine-tenths of the population of France remained Roman Catholic. In these circumstances Henry IV deemed it expedient to announce his conversion to Catholicism, while at the same time protecting his former Huguenot friends by issuing in 1598 the Edict of Nantes (q.v.).

Holland.—In Holland Calvinism spread gradually in the middle of the sixteenth century until it attained such a firm hold among the liberty-loving Dutch that they rose in 1568 in political and religious revolt against the cruelties and oppression of the Catholic governors sent by Philip II of Spain. The leadership of the revolt was taken by William the Silent, of the noble house of Orange-Nassau. Though often defeated and forced to retreat, he retained the love and confidence of the Dutch until they formed themselves into a republic by the Union of Utrecht (1579) and declared themselves independent of Spain (1581). William the Silent was assassinated soon afterward by a Catholic zealot (1584). But the Eighty Years' War of Liberation was continued under the leadership of his descendants until in 1648, in the Peace of Westphalia, Spain finally gave up the claim to an authority which she could no longer exercise.

Scotland.—In Scotland the way for the Calvinistic Reformation was prepared by the remnants of Lollardy among the people. The beginnings of a reform movement under Lutheran influence were made by Patrick Hamilton, who was martyred for his faith in 1528, and by George Buchanan, who was imprisoned but managed to escape. The decisive movement was led by the fiery John Knox (1515–72). Captured by the French and forced to sit for 19 months chained as a galley slave, he afterward returned to England and preached for five years (1549–54). The accession of the Catholic Mary Tudor drove him from England to Geneva, where he became an ardent disciple of Calvin. In 1559 he returned to Scotland to lead the Calvinistic Reformation. In 1560 he persuaded the Scottish Parliament to adopt a confession of faith and book of discipline adapted from those at Geneva to meet the special conditions in Scotland. It provided for the government of the Scottish Presbyterian church by local kirk sessions and by a general assembly composed of ministers and presbyters representing the local churches of all Scotland. Mary, Queen of Scots, attempted to overthrow the new Protestant church, but after a seven years' struggle she herself was forced to flee across the border to England. Calvinism was left triumphant in Scotland, except for a few districts in the north, where noble families adhered to the old faith.

Calvinistic or Reformed doctrines also spread into western Germany and were taken up by some of the German princes, notably by the Hohenzollern family in Brandenburg in 1613. But Calvinism met with bitter opposition in Germany for more than a century from both Catholics and Lutherans.

Reformation in England. The English revolt from Rome differed from the revolts in Germany, Switzerland, and France in two respects. First, England was a compact nation with a strong central government, and therefore, instead of splitting into parties and ending in civil war, the revolt was national, the King and Parliament acting together in transferring to the King the ecclesiastical jurisdiction hitherto exercised by the Pope. Second, in the continental countries a religious agitation by the people had preceded and caused the political break from Rome; but in England the political break came first, over the question of Henry VIII's divorce, while the change in religious doctrines and modes of worship came long afterward in the reigns of Edward VI and Elizabeth. When Lutheran doctrines began to make headway in England, where the ground was well prepared by Wiclif's earlier teachings, Henry VIII had hastened to write a pamphlet attacking the Wittenberg heresies. For this he received from the Pope the title Defender of the Faith, ever since borne by English monarchs. Eight years later, however, he wished to divorce his Catholic wife, Catharine of Aragon. As she had been previously married to his brother Arthur, she ought not, by ecclesiastical law, to have contracted a similar relation with Henry; but a special dispensation had been granted by the Pope setting aside the ecclesiastical law. The question now was whether this dispensation was valid. Henry claimed that it was not and that he and Catharine ought to separate. The Pope upheld the validity of the dispensation and, for political as well as religious reasons, refused to annul the marriage or sanction a divorce. Henry then turned to the reformers and foreign universities for an opinion. From Zwingli and Œcolampadius he received the advice that his marriage was null; from Luther and Melanchthon, that it was binding, but that polygamy was lawful in certain circumstances. Henry followed the advice of both: he married Anne Boleyn on Jan. 25, 1533, and on March 30 of the same year had Thomas Cranmer, Archbishop of Canterbury, sitting in an ecclesiastical court, pronounce his divorce from Catharine. When he was excommunicated by the Pope, Henry replied in 1534 with the Act of Supremacy passed by a submissive Parliament. This Act appointed the King and his successors "supreme head of the Church of England," i.e., of a national Anglican church. Other acts of Parliament cut off all the Pope's revenues and put a complete end to his political and religious authority in England. The monasteries were suppressed (1536–39) and their property greatly added to Henry's resources. Beyond these changes Henry did not want to go. To prevent the spread of Lutheran doctrines and practices, Henry secured from Parliament in 1539 the severe Act of Six Articles, which declared it heretical, with heavy penalties, to deny transubstantiation, communion in one kind, sacerdotal celibacy, inviolability of the vow of chastity, and the necessity of private masses and auricular confession. Several Lutherans were burned, while those who upheld the supremacy of the Pope were executed as traitors. Under Edward VI (1547–53) the Protestant religious doctrines and practices which Henry VIII abhorred were introduced into the Anglican church. The Act of Six Articles was repealed at once (1547), and several continental reformers, including Martin Bucer, were invited to England. The first Prayer Book of Edward VI, adopted in 1549, provided a uniformity of service which was enforced by law on all. This was followed by a second Prayer Book in 1552 and by a new creed in forty-two articles. Mary Tudor (1553–58) endeavored to restore the Roman Catholic religion and burned many Protestants at the stake. Other Protestants, like Knox, fled to the Continent, where they were strengthened and often made more radical by contact with Calvinism. The final settlement came under Queen Elizabeth (1558–1603) in the year 1563. The Forty-two Articles of Edward VI were reduced to the Thirty-nine Articles which still form the Anglican creed. This creed is Protestant and closer to Lutheranism than to Calvinism; but the episcopal organization and the ritual of the Anglican church were largely retained from the Roman Catholic church. A large number of people under Elizabeth did not feel that this Established church was sufficiently reformed and purified of Romanism; they formed numerous Calvinist sects—Presbyterians, Puritans, Brownists, Separatists—known collectively as dissenters or nonconformists.

Minor Sects. Besides the three great churches, Lutheran, Reformed, and Anglican, there were born of the Reformation a large number of small sects, a natural consequence of the Protestant repudiation of traditional authority and exaltation of private judgment. In the first years of the revolt there arose at

Zwickau in Saxony a small body known as Anabaptists, because of their belief that infant baptism was invalid and their insistence that adherents to their church should be rebaptized. Though frowned upon by Luther, their propaganda spread with extraordinary rapidity throughout Germany. The diversity of their opinions was marked. Some were Quietists, like the later Quakers. Others believed in the renovation of church and state by armed revolt and contributed to the Peasant Revolt of 1524–25. In 1529 the Diet of Spires condemned the Anabaptists to death, and this was promptly acted upon by Lutherans and Zwinglians as well as by Catholics. In 1534 under the tailor, John of Leyden, they obtained the upper hand in Münster, and scandalized Europe by their polygamy and communism, until they were suppressed by a combined force of Lutherans and Catholics. In 1538 England passed a law condemning them to death. For a century they suffered martyrdom, but they survived nevertheless and are the predecessors of the present Baptist church.

Unitarianism was also sporadic in the sixteenth century. The Spaniard, Michael Servetus, for his *De Trinitatis Erroribus* (1531), was burned at Geneva in 1553. The Italians Lelio and Fausto Sozzini expressed their doubts about the Trinity to a group of friends in 1546. They were compelled to seek safety north of the Alps, and formed a considerable number of antitrinitarian followers in Switzerland, Germany, Holland, and Poland.

General Results of the Reformation. The Protestant Revolution was only partially successful. Where it succeeded it strengthened the national life of the Protestant nations and tended towards the blending of all social classes into one community. Where it failed it produced, as every unsuccessful revolution does, reaction. In the Catholic nations, like Spain and France, the civil and ecclesiastical authorities were more closely allied than before. The Inquisition and the Index were symbols of one kind of despotism, as the French Bastille was of the other. Where it partially succeeded and partially failed, as in Germany and Switzerland, it resulted in civil wars and in the long postponement of the growth of a healthy, vigorous national life. The Reformation greatly advanced the growth of national languages and literature. Luther's Bible and Calvin's New Testament and *Institutes* became classical models for the language of religious and philosophical thought. The fact that the religious controversies of the time were carried on largely in the language of the people instead of in Latin, and that there was such an increase in the popular reading of the Bible and the singing of hymns in the vernacular, greatly stimulated the development of the new national tongues. Popular education received a similar stimulus through the New Learning and the new schools of Colet in England, of Calvin in Geneva, and of the Protestant princes in Germany. Religion became less a thing of the clergy and more a thing of the people. Religious toleration, however, made but little progress for a century. All the sects persecuted those who differed materially from themselves. The Reformation was accompanied by an increase of the witchcraft delusion, so that more unhappy wretches were burned on this charge in the sixteenth century than in any preceding one.

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REFORM'ATORIES. Penal institutions for young offenders where the object of punishment is subordinated to that of moral regeneration. It is difficult to fix definitely the time when it was recognized that juvenile offenders should not be merely punished for crime, but that efforts should be made to reform them.

The philanthropic efforts of John Howard and Elizabeth Fry in the eighteenth century prepared the way for new views in penology. At the same time interest in the care of neglected children and of juvenile delinquents, which had from the days of Queen Elizabeth found expression in the English Poor Law, was leading to many new experiments. The most valuable of these, however, was first tried in Germany, where in 1833 the Rauhes Haus (q.v.) in Hamburg introduced the plan of having the children cared for in families on the cottage plan. This principle was adopted at Mettray, France, in 1839 and has since become the favored method for juvenile reformatories, though the congregate plan still exists and has its adherents. Captain Brenton, of England, about 1830 urged that no child under 16 should be sent to prison, but should be trained in some special institution. In accord with his ideas an industrial school for girls was started at Chiswick. In 1847 the institution at St. George's restricted its care to boys charged with or convicted of crime. From this time the movement made progress in England. In 1854 the Reformatory Schools Act was passed, which took legal cognizance of the principles of the reformatories. France in 1850 had already enacted similar legislation. Distinction must be made between the purely industrial schools which receive children who are destitute and the reformatory schools which receive those guilty of criminal acts. Sometimes, particularly in the earlier institutions, the two classes were mixed. See Poor Laws.

The reformatory system has had its widest development in the United States. In 1824 the House of Refuge on Randall's Island, New York, was established by law. It was and still is conducted on the congregate plan. Other cities followed the example. Such houses of refuge were under private control, but the public shared in the expense. These early institutions were followed by State reform schools. The change in names is interesting. All indications that the boys were committed to the institution for breaches of the law were avoided, as, e.g., in the title of the Lyman School for Boys (1848). Besides these institutions for delinquents there have sprung up many industrial schools for orphans and neglected children. Usually the two are separated, and the sexes also are usually in separate schools. In the earlier institutions the employment of the children was too often decided from a financial standpoint solely. It is now recognized that it should be not productive, but instructive.

It remained for the United States further to develop the reformatory system and make it applicable to young men and women. The principles introduced at Norfolk Island by Machonochie, and in Ireland by Crofton, had found favor in the country. It was proposed to combine these with the principles of the reformatories and seek not merely to punish, but to bring to self-support and self-respect, the younger criminals for whom there might yet be hope. The beginning of this movement dates from the National Prison Congress of 1870, at which Z. R. Brockway outlined a plan for a new class of institutions. In 1866 New York had enacted legislation establishing a reformatory. The plans were altered in 1869, but it was not opened until 1876, when Mr. Brockway was appointed superintendent of the Elmira Reformatory (q.v.). In 1877 the principle of the indeterminate sentence was legally adopted. The growth of the institution and its constant success won world-wide attention. In 1877 Massachusetts founded a reformatory for women at Sherborn and in 1884 one for men at Concord. Many other States have followed the example of these two.

The fundamental idea of these reformatories is that instead of repressive and punitive meassures there should be constant training along lines of industry, physical and mental development, to enable the prisoner to stand alone after his release. To make more effective this training, his self-interest is appealed to by the indeterminate sentence. This makes the length of his stay in the institution largely dependent upon his behavior and progress while there. He is thus stimulated to take advantage of his opportunity. His release is conditional, and if he violates the terms of his parole he may be returned to the institution. The claim is made that fully 80 per cent of young felons released from American reformatories have subsequently led upright lives. Unfortunately the claim can be neither supported nor disproved, because there has nowhere been any systematic trace and record kept after the full term of the original sentence has expired.

The age limits within which first offenders are sentenced to reformatories vary. The lower limit is usually 15 or 16 years. The upper limit seldom exceeds 30. In form of construction reformatories are like prisons with separate cells. The inmates are divided into grades, usually three. The Sherborn Reformatory for Women in Massachusetts has four. There are different privileges for the different grades, and release on parole is open only to those in the highest.

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REFORM BILLS. In English history, the name of several measures introduced into Parliament, chiefly during the nineteenth century. These bills, three of which were passed—viz., in 1832, 1867, and 1884–85—abolished the abuses which had grown up in regard to the representation in the House of Commons and greatly extended the suffrage. For details regarding the struggle, which preceded the passing of the great Reform Bill of 1832, see GREY, CHARLES, second EARL GREY; for the provisions of the various acts, see PARLIAMENT. See also sections on *History* and *Government* under GREAT BRITAIN.

REFORMED CATHOLIC CHURCH. A movement begun in New York City between 1880 and 1885 among priests who had renounced the jurisdiction and doctrine of the Roman Catholic church and engaged in evangelistic labors among the people. It had, in 1915, 7 ministers, 6 church organizations, and about 3250 members, chiefly in New York, Massachusetts, Pennsylvania, and Illinois.

REFORMED CHURCHES. A term employed in a conventional sense to designate those Protestant churches which follow the doctrines and polity of Zwingli and of Calvin (qq.v.) rather than the Lutheran. (See LUTHERANISM.) The influence of Calvin proved more powerful than that of Zwingli, and on the continent of Europe the Reformed churches are generally known as Calvinistic churches, the name Protestant church in some countries being almost equivalent to Lutheran. One chief distinction of the Reformed churches is their doctrine of the Lord's Supper (q.v.). They also reject certain ceremonies which the Lutherans have seen fit to retain. The Church of Scotland, the Protestant church of France, that of the Netherlands, some German churches, and the Protestant churches of Hungary, Bohemia, and Poland belong to the Reformed churches, while the English dissenting churches are closely connected with them. Most of the Protestant churches in the United States belong to the Reformed rather than to the Lutheran group. See PRESBYTERIANISM; REFORMATION.

REFORMED CHURCHES HOLDING THE PRESBYTERIAN SYSTEM, ALLIANCE OF. See ALLIANCE OF THE REFORMED CHURCHES HOLDING THE PRESBYTERIAN SYSTEM.

REFORMED CHURCH IN AMERICA, THE. A body of Christians in the United States composed originally of settlers from Holland, but now largely intermixed with elements from many other sources. Until 1867 it was known as the Reformed Protestant Dutch Church in North America. The history of the church begins with that of the Reformation in the Netherlands, where the movement met with a hearty welcome.

Entering from Germany, it afterward received its chief impetus from Switzerland and France. Hence its distinctive type of the Reformed doctrine and the more democratic Presbyterian polity. But in Holland, as elsewhere, there had been a great preparation made by Reformers before the Reformation. The monks John Esch and Henry Voes for their evangelical preaching were burned at Brussels (1523) and were perhaps the first martyrs of the Reformation. The Reformed Church of the Netherlands began her more formal existence in 1566, when the so-called League of Beggars was formed. Field preaching and the singing of evangelical hymns rapidly spread the Reformed doctrine. Conventions or synods of the Dutch Reformers during the next two decades formulated a liturgy and rules of church government and adopted standards of doctrine—the Belgic Confession and the Heidelberg Catechism (qq.v.). Because of Spanish persecution these synods were held outside of Dutch territory. In 1643 copies of these rules of church government were sent to the Westminster Assembly as a specimen of Presbyterian polity. In 1618–19 the famous Synod of Dort (q.v.), called to consider the controversy which had sprung up between the Calvinists and Arminians, formulated the Canons of the Synod of Dort.

The earliest Dutch church organization in America was made in New York in 1628 by Rev. Jonas Michaëlius. This is now the strong and wealthy Collegiate Church, with its half-score of buildings and 14 ministers. During the government of the West India Company down to 1664, 13 Dutch churches were established in America and 16 ministers in all had officiated. Then came the English conquest. Dutch immigration ceased. It was a question whether the Dutch church could survive under the English government. During the next half century there was an almost constant struggle with the English governors, who naturally sought to establish the Church of England. During this same period there was also a considerable accession of Huguenots to the country, who largely fell into the fold of the Dutch church. At first, however, during the reigns of Charles II (1660–85) and James II (1685–88), full liberty was ostensibly granted to all denominations. But with the accession of William III (1688) the normal policy of the English government was restored, and more persistent attempts were made to impose the Church of England on a population which was overwhelmingly Dutch. A Ministry Act was secured in 1693, but it had been so emasculated in its passage that it was found to be entirely unsectarian; yet it was often arbitrarily perverted by certain of the governors in favor of the Church of England. Because of such perversion the Dutch church of New York City managed in 1696 to extort a charter from Governor Fletcher, and this course was successfully followed by other Dutch churches, so that the Dutch church really remained ecclesiastically independent.

A church organization styled the cœtus was formed in 1747, but, owing to ecclesiastical interference from Holland, it found itself unable to ordain. Hence it declared itself an independent American classis with full powers in 1754. Meantime an effort was made to establish a Dutch divinity professorship in King's College, New York City, which was accomplished in 1775, but this split the church more completely and led to the securing of a charter for Queen's College (New Brunswick, New Jersey) in 1766 and an amended charter in 1770. The two parties came together in 1771 upon articles of union, securing semi-independence from the Church of Holland, but the Revolution delayed the speedy development of the new plans. In 1784 a professor of theology was elected, Rev. Dr. John H. Livingston, and this was the beginning of a theological seminary, the first in the country.

In 1792 an Americanized constitution of church government was adopted, which has gone through two revisions since, viz., in 1832 and 1874. The church continued to grow slowly. In 1800 there were about 100 churches and 40 ministers in service. The number of ministers did not equal the number of churches until 1845, when there were 375 of each. In 1846 began a new Dutch immigration which settled in the Middle West, but is now penetrating even to the Pacific coast. Many of these newcomers fell into the old Dutch church, and there are now more than 200 churches from this source and as many ministers.

In doctrine the Reformed Church in America has ever adhered to the standards already referred to, adopted in Holland. She also indorsed the Westminster Catechism in 1837. Her form of government is of the so-called Presbyterian type, first proposed by Calvin, and was adopted in 1568. This enumerated four classes of officers in the church, viz., ministers, teachers (or professors), elders, and deacons. Four grades of ecclesiastical bodies were also defined, viz., consistories, classes, provincial synods, and a General Synod. The Reformed church has a liturgy, but this is obligatory only in the administration of the sacraments and ordinations. It has received some additions from time to time as necessity required. The General Synod of 1906 announced the adoption of a revised liturgy, the forms for the administration of the sacraments not to take the place of the old, but to be used as alternates. In all other respects her mode of worship is free. The General Synod is incorporated and holds all funds and endowments of the theological seminaries and, in part, of the colleges and other agencies. The General Synod operates through a board of direction. The colleges are also incorporated as well as the various boards, such as the board of education, the board of foreign missions, the board of domestic missions. The churches exist in New York, New Jersey, Pennsylvania, Maryland, Ohio, Michigan, Wisconsin, Indiana, Illinois, the Dakotas, Minnesota, Kansas, Nebraska, Montana, South Carolina, Wyoming, Maine, Washington, and Manitoba.

In 1915 the Reformed Church in America reported 718 churches, 750 ministers, 71,000 families, and 127,000 communicants. There are also about 129,000 enrolled in the Sabbath schools. Nearly $552,000 was raised during the year for benevolent objects and $1,700,000 for congregational purposes. The church has several flourishing institutions: Rutgers College (1766) and a theological seminary (1784) at New Brunswick, N. J.; Hope College (1866) and the Western Theological Seminary (1866) at Holland, Mich.; and incipient institutions in other States. The church has been especially successful on the foreign field, having missions in India, China, Japan, and Arabia. The foreign missionaries numbered, in 1906, 100, of whom 22 were in China, 31 in India, 28 in Japan, and 19 in Arabia. The missions in China and Japan are working in hearty union with missions of other denominations.

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REFORMED CHURCH IN THE UNITED STATES, The (German Reformed). The founders of this denomination came to America from the Rhine provinces of Germany and from the German cantons of Switzerland. Among them were also influential French and Dutch families of the Reformed faith. They arrived in considerable numbers from 1710 to 1770, and Reformed congregations were established by the Palatines or the Swiss in the Colonies of New York, Pennsylvania, Maryland, Virginia, Carolina, and Georgia. The first congregation was located at Germantown, Va., in 1714. The pastor was the Rev. John Henry Haeger. The Reformed congregations in the Colonies, barring those in Pennsylvania, were gradually absorbed by neighboring Presbyterian, Episcopalian, or Lutheran churches, but the church became a denominational organization in the German and Swiss settlements of Pennsylvania. The first Reformed minister in this province was the Rev. Samuel Guldin (1664–1745). The organizer and first pastor of the three original congregations was John Philip Boehn (1725), located in the region of Montgomery and Bucks counties, but before 1740 at least 24 Reformed congregations are known to have existed in Pennsylvania. The leading ministers of this period were Boehn, Templeman, Weiss, Rieger, and Goetschius.

In 1747 the congregations were united in a cœtus (synod) under the leadership of the Rev. Michael Schlatter (1716–90), who was sent to America by the synods of North and South Holland. During the cœtal period the church was under the jurisdiction of the Holland synods. Both ministers and funds for the support of ministers were received from Holland, Germany, and Switzerland.

The cœtus in 1793 became independent of Holland oversight, turning into a synod. It adopted a constitution of its own and assumed the name "The Synod of the Reformed (High) German Church in the United States of America." At this time there were about 15.000 communicants. The great majority of the congregations were located in Pennsylvania, but congregations were also found in New York, New Jersey, Maryland, Virginia, North Carolina, and Ohio.

In the early period of the synod the institutions and equipment which are indispensable to the growth of a denomination were wanting. It was the time of congregational individualism, and even congregations were divided by bitter controversies on the question of language in worship. A missionary and an educational spirit awoke in the second and third decades of the nineteenth century. The first missionary committee was appointed by the synod in 1819, and the first missionary society was organized in 1826. In 1824 the Synod of Ohio was organized. The first theological seminary was opened in 1825 at Carlisle, Pa. (now at Lancaster, Pa.), and Marshall College (now Franklin and Marshall College at Lancaster, Pa.) was chartered in 1826 at Mercersburg. The *Magazine of the German Reformed Church*, now known as the *Reformed Church Messenger*, was published in 1827. The first volume of the *Mercersburg Review*, a theological quarterly, now known as the *Reformed Church Review*, appeared in 1849.

The General Synod, including originally 2 district synods and 21 classes, was organized in 1863. In 1915 it was composed of 9 district synods and 61 classes. Since the organization of this judicatory the church has made remarkable progress in all lines of work, both at home and abroad. The relative numerical strength of the Reformed Church in the United States is shown by the fact that it ranks second on the roll of Reformed and Presbyterian churches in the United States and Canada. In 1915 the statistics were as follows: synods, 915 English and 4 German (three-fourths of the communicant members are in the English synods; many congregations in the German synods have English preaching); ministers, 1217; congregations, 1770; communicant members, 312,660; unconfirmed, 134,751; benevolent contributions, $594,-000; congregational purposes, $2,161,000; home missionary congregations, 238; 31 missionaries in Japan; 30 missionaries in China; orphans' homes, 7; theological seminaries, 3; colleges for men, 5; colleges for women, 2. Flourishing schools are connected with the Japanese and Chinese missions.

The Heidelberg Catechism (q.v.) serves both as a confession of faith and as a book of instruction. The policy of the church is presbyterial. In its mode of worship it is bound neither to a ritual nor to a free service. It has liturgical forms for morning and evening worship and for the special services of the Lord's Supper, baptism, etc., but it allows the congregation the use of a free service. The festivals and seasons of the Church year are generally observed. Baptized children are prepared for communicant membership under special oversight of the pastor through catechetical instruction and received by the rite of confirmation.

From 1840 to 1878 the church passed through a theological and a liturgical controversy. It was caused by the introduction, by Dr. Philip Schaff and Dr. John W. Nevin, of German philosophy and theology of the mediatorial type into the Theological Seminary at Mercersburg, Pa. The distinctive system of thought came to be known as the "Mercersburg theology." The church was divided into two parties, without a schism, known as the high church or liturgical party and the low church or antiliturgical party. The controversy closed with the introduction of the peace movement in the General Synod of 1878. See MERCERSBURG THEOLOGY.

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REFORMED EPISCOPAL CHURCH, THE. A church which was organized by such members of the Protestant Episcopal church as were opposed to the growth of sacramentarianism and sacerdotalism in that communion, and for any others who, like-minded with them, desire to be associated with a church evangelical in its teachings, liturgical in its worship, and episcopal in its government. It was organized in New York City, Dec. 2, 1873, with 8 clergymen, including 1 bishop, and 20 laymen. all of whom had been or were at the time ministers and laymen in the Protestant Episcopal church identified with the evangelical or Low Church party. One of them, George David Cummins, had been Assistant Bishop of the diocese of Kentucky until Nov. 10, 1873, when by letter to the presiding Bishop he resigned his office and withdrew from the denomination. He became the first and presiding Bishop of the new church; the Rev. Charles Edward Cheney, of Chicago, was also elected Bishop and consecrated on a subsequent day. The following statement, condensed from the declaration of principles adopted at the organization, explains in the briefest form possible the doctrines held: I. The Reformed Episcopal church declares its belief in the Holy Scriptures of the Old and New Testaments as the word of God and the sole rule of faith and practice: in the Apostles' Creed: in the divine institution of the sacraments of baptism and the Lord's Supper; and in the doctrines of grace substantially as they are set forth in the 39 articles of religion. II. It recognizes and adheres to episcopacy, not as of divine right, but as a very ancient and desirable form of Church polity. III. Retaining a liturgy, not imperative or repressive of freedom in prayer, it accepts the Book of Common Prayer as it was revised, proposed, and recommended for use by the General Convention of the Protestant Episcopal church (1785); reserving the right to make alterations in it, provided that the substance of faith be kept entire. IV. It condemns and rejects the following doctrines as contrary to the word of God: (1) That the Church of Christ exists only in one form of ecclesiastical polity. (2) That Christian ministers are "priests" in another sense than that in which all believers "are a royal priesthood." (3) That the Lord's table is an altar on which an oblation of the body and blood of Christ is offered anew to the Father. (4) That the presence of Christ in the Lord's Supper is a presence in the elements of bread and wine. (5) That regeneration is inseparably connected with baptism.

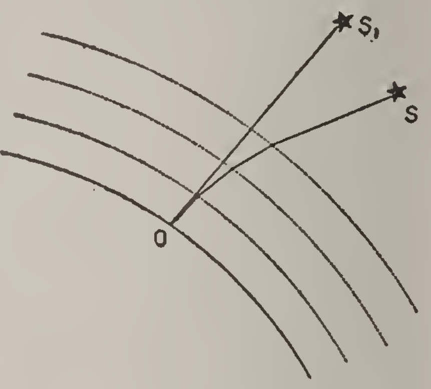
At the twentieth General Council, Philadelphia, 1906, there were reported as belonging to the church in the United States and Canada, 9 bishops, 83 ministers, 80 parishes, about 11,000 communicants, 850 Sunday-school teachers, and a total of about 10,000 teachers and scholars; annual offerings about $475,000; value of church and parish buildings and rectories, $1,371,977. The church has a small membership in England. The denomination is strongest in Philadelphia and Chicago. It has a well-equipped and endowed theological seminary in Philadelphia, maintains two denominational papers, and supports a woman's foreign missionary society, with stations in India. It has a denominational endowment fund of about $350,000. Consult A. D. Price, *History of the Formation and Growth of the Reformed Episcopal Church* (Philadelphia, 1902).

REFORMED MENNONITES, The. See Mennonites.

REFORMED PRESBYTERIANS. See Cameronians; Presbyterianism.

REFRAC′TION (ML. *refractio*, breaking up, refraction, from Lat. *refringere*, to break up, from *re-*, back again, anew + *frangere*, to break). A phenomenon, like reflection, common to all kinds of wave motion. If there are two media separated by a bounding surface in which the trains of waves of the particular kind travel with different velocity, a train of waves in one medium will, on reaching the bounding surface, produce similar waves in the other medium; these are called refracted waves, because in general each ray of the incident waves has its direction changed or broken at the surface. (See Light.) Snell's laws for refraction are that the angles α_1 and α_2 made by the incident and refracted rays with a perpendicular to the refracting surface at the point of incidence are connected by the relation $\frac{\sin\alpha_1}{\sin\alpha_2} = n$, a constant for the two media if the waves have a constant wave number, and that the two rays and the perpendicular to the surface are in one plane. It is easily seen that the index of refraction is the ratio of the velocities of the waves in the two media V_1 and V_2, viz., $\frac{\sin\alpha_1}{\sin\alpha_2} = \frac{V_1}{V_2}$. Therefore this ratio, which is called the index of refraction, is different for different media; and for any one case it varies with the wave number if there is dispersion (q.v.). Refraction is illustrated in aërial waves by the effect on them of heated columns of air, and in the case of ether waves by the action of prisms, etc. It is important to realize that, in the case of a train of waves passing from one medium into another, the wave number is not changed. If the velocities in the two media are V_1 and V_2 and, if N is the wave number, the wave lengths in the two media are respectively $\lambda_1 = \frac{V_1}{N}$, $\lambda_2 = \frac{V_2}{N}$. Certain crystals and strained isotropic bodies exhibit double refraction; i.e., if a ray of light falls upon them there are two refracted rays. See Light.

REFRACTION, Astronomical. The effect of refraction in the appearance of the heavenly bodies is to make them appear higher in the sky. Thus refraction increases the altitude, but it does not alter the azimuth. In the figure S is the true position of the star and S_1 the apparent. The refraction is greatest at the horizon, where it is about 37′. This is evident since the angle of incidence is here the greatest. From the horizon to the zenith the refraction constantly decreases, very rapidly near the horizon and more slowly at greater elevations. It varies approximately as the tangent of the zenith distance down to a zenith distance of about 70°, and is entirely independent of the distance.



The effect of refraction upon the rising and setting of the heavenly bodies is to make them appear to rise earlier and set later than they would if there were no atmosphere. The horizontal refraction varies from 35′ to 39′. Therefore when we see the sun's lower limb rising the whole disk is really below the horizon. In this way the refraction accelerates the sunrise and at sunset delays it an equal amount. Thus the total effect of refraction is to increase the length of the day at the expense of the night from four to eight minutes, according to the inclination of the sun's diurnal circle to the horizon.

Refraction also explains the elliptic appearance of the sun's and moon's disks when near the horizon. Owing to the rapid increase in the amount of refraction near the horizon, the lower limb appears more elevated than the upper, thus shortening the vertical diameter.

Another effect of refraction when the air is much disturbed is to make the stars "dance," especially when seen through a large telescope with high power. This is due to the constant displacement of the image by the varying refraction.

REFRIG′ERANTS (from Lat. *refrigerans*, pres. p. of *refrigerare*, to cool again, from *re-*, back again, anew + *frigerare*, to cool, from *frigus*, Gk. ῥῖγος, *rhigos*, cold). A name given to a class of medicines that reduce the temperature of fevers, allay thirst, and cause a feeling of coolness and refreshment throughout the system. They reduce and equalize blood pressure, quiet the overexcited heart, and excite perspiration and an increased urinary flow. By stimulating the excretory functions they help to eliminate the toxic products of inflammation. Most of these remedies belong to the class of the vegetable acids and their salts, but aconite and similar drugs, which act primarily on the circulation, may also be considered refrigerants. The vegetable acids used are tartaric, citric, and acetic. Citric acid may be conveniently given in the form of lemonade or orange juice; acetic acid in the form of vinegar. The diaphoretic refrigerants (those which excite perspiration) are aconite, veratrum viride, and potassium citrate. The latter is a favorite ingredient of so-called fever mixtures. The diuretic refrigerants (those which stimulate the urinary flow) are the bicarbonate, citrate, acetate, bitartrate (cream of tartar), sulphate, chlorate, and nitrate of potassium. Potassium carbonate is active particularly in the form of the ethereal spirit popularly known as sweet spirit of nitre. Most of the refrigerants, however, are both diaphoretic and diuretic in their action.

REFRIGERATING MACHINES. See Refrigeration.

REFRIGERATION, rē-frĭj′ẽr-ā′shŭn (Lat. *refrigeratio*, from *refrigerare*, to cool again). The art of producing cold by artificial and particularly by mechanical means. It was practiced in very ancient times, but only in comparatively recent years has it been profitably done on a commercial scale. Mechanical refrigeration is now employed in the manufacture of artificial ice; for the freezing and chilling of freshly killed meat in slaughterhouses; for the cooling of stores for meat, fish, fowl, fruits, vegetables, and other perishable provisions; for cooling the atmosphere of auditoriums, dwellings, and hospitals; for storing furs and other valuable garments to protect them from moths; for certain engineering operations; and for a variety of manufacturing processes. The number and variety of refrigerating devices available for these purposes are very great, but they all belong to one or the other of the following five classes: (1) devices in which the more or less rapid liquefaction of a solid is utilized to abstract heat; (2) devices by which the abstraction of heat is effected by the evaporation of a portion of the liquid to be cooled; (3) devices in which the abstraction of heat is effected by the evaporation of a separate refrigerating agent of a more or less volatile nature, which agent is subsequently returned to its original condition by mechanical compression and cooling; (4) devices by which the abstraction of heat is effected by the evaporation of a separate refrigerating agent of more or less volatile nature under the direct action of heat, which agent again enters into solution with a liquid; (5) devices in which air or other gas is first compressed, then cooled, and afterward permitted to expand while doing work. These five processes of refrigeration are termed, respectively, the liquefaction process, the vacuum process, the compression process, the absorption process, and the cold-air process.

Liquefaction Process. Liquefaction is one of the most ancient methods employed for artificial cooling. The reduction of the temperature of water by the melting of saltpetre is said to have been known in India at a very remote period. The Romans are said to have cooled wine by immersing the bottle containing it in a second vessel filled with cold water, into which saltpetre was gradually thrown, while at the same time the bottle was rapidly rotated. Freezing water by the use of a mixture of snow or powdered ice and saltpetre was mentioned by Latinus Tancredus in 1607, and wine by means of snow and common salt by Santorio in 1626. The best among the many forms of apparatus for making ice on this principle are probably those of Toselli and Siemens. In Toselli's machine the frigorific agent employed is a mixture of ammonium nitrate and water, which produces a reduction of temperature of about 40° F. The apparatus consists of a vessel in which the solution of the ammonium nitrate is effected and of a can wherein are placed a number of circular molds of different sizes. These molds, previously filled with water, are inserted in the freezing mixture and a thin film of ice is formed round their edges; these tapered tubes of ice are then withdrawn from the molds and placed one inside the other, thus forming a small stick of ice. In Siemens's apparatus the frigorific agent is calcium chloride, whose dissolution in water produces a reduction of temperature of only 30° F., and to admit of this reduction being sufficient to produce ice with water at an initial temperature of 65° F., a heat interchanger is provided in which the spent liquor, which is at a temperature of about 30° F., is employed to cool the water before it is mixed with the salt. The Siemens apparatus has been used in making artificial ice with much success, but, being less economical than more modern ice machines, never came into general use. When these devices or others of the same type are used for cooling purposes, brine is cooled in them and then circulated in the usual manner through a system of circulating pipes. The general law governing the production of cold by frigorific mixtures is that during the liquefaction of a solid a certain amount of heat not indicated by or sensible to the thermometer is absorbed, which heat is abstracted from any surrounding bodies. The absorption of heat from the surrounding bodies is the greater the more rapidly the solid is liquefied.

Vacuum Process. The cooling of liquids on this principle depends upon the conversion of the sensible heat into latent heat (see Heat) during evaporation, and has been practiced in all ages. A primitive example of this process in its crudest form is the practice in India and other warm countries of placing earthen vessels of water in a natural or artificial draft so that the liquid may be cooled by surface evaporation. The first machine for the production of ice by the vacuum process appears to have been invented in 1755 by Dr. Cullen, who in that year made the discovery that the evaporation of water could be facilitated by the removal of the atmospheric pressure by means of an air pump, to such a degree as to enable him to freeze water even in summer. This apparatus was the parent of all those subsequently designed, but seems not to have been a commercial success. In 1777 Nairne found that by the introduction of sulphuric acid into the receiver for the exhaust the aqueous vapor could be absorbed from the rarefied air and the latter dried, thus preventing the formation of a permanent atmosphere over the water and hindering the continuity of the evaporation. Nairne was followed by other inventors, but it was not until the second quarter of the nineteenth century that Edouard Carré invented a commercially successful machine adapted to produce the *carafes frappés* commonly used in Parisian cafés and restaurants. This machine consisted of a cylindrical vessel intended to contain the charge of concentrated sulphuric acid, of an air pump so arranged that it could be connected to the mouth of the carafe, and of an agitator coupled to the air-pump lever for the purpose of keeping the sulphuric acid in motion. The Carré machine proved most successful for its purpose, and improved forms of the device are still manufactured, the largest of which are capable of producing 80 pounds of ice per day. In 1878 Franz Windhausen patented a vacuum machine, an improved form of which was installed in 1881 at the Aylesbury Dairy, London, England. This machine was nominally capable of producing from 12 to 15 tons of ice per 24 hours. The ice-forming vessels in this machine were six in number, circular in transverse section and slightly tapered. The mouths of these vessels were connected with the sulphuric-acid chamber and the vacuum pump, and water was admitted to them in fine streams, which offered extended surfaces for evaporation and almost instantly congealed into ice globules which fell to the bottoms of the molds and there froze together. Like the liquefaction process, the vacuum process cannot compete in economy with the more strictly mechanical processes, and vacuum machines are now used only for domestic ice making and similar small installations.

Compression Process. The system of absorbing heat and thus producing cold partly by vaporization and subsequent liquefaction and partly by compression and cooling is in accordance with the well-known law of physics that all substances during the process of passing from a liquid to a gaseous state are bound to absorb a certain amount of heat and while returning from a gaseous to a liquid state to give up or throw off the same amount of heat. Whatever the refrigerating or heat-absorbing agent which may be used, the following cycle of operations is obligatory in all machines working upon this principle: (1) Compression, i.e., the refrigerating agent in gaseous form is subjected to a pressure sufficient to reduce it to a liquid form, this pressure varying with the nature of the agent and the temperature of the condensing water. During this compression a degree of heat is developed in accordance with the amount of pressure to which the gas is subjected or to the volume to which it has to be reduced relatively to that of the gas in order to produce liquefaction. (2) Condensation, during which process the heat developed during the compression of the gas is carried away by forcing the latter through water-cooled pipes, the heat being transferred to the cooling water. At this point the gas is ready to assume the liquid form, in doing which an additional amount of heat is given off to the water. (3) Expansion, during which the liquefied gas is admitted to series of coils of pipe and, being suddenly relieved of pressure, instantly flashes or expands into gaseous form, in doing which, according to the above-mentioned law of physics, it is forced to take a quantity of heat which it draws from the surrounding objects, first, of course, the pipes wherein it is confined, and second, such substances as may be in contact with the pipes and which it is desired to cool, as air, water, and brine. The amount of heat thus abstracted or absorbed is equal to that previously given up to the cooling water in the condenser. This cycle of compression, condensation, and expansion having been completed, the refrigerating agent is in its first state again and is ready for another cycle. The three operations described being essential, all machines operating according to the compression process, however much they may differ in more or less important details, must consist of these main parts, as shown by the diagram Fig. 1: (1) a compressor, *A*, in which the gas is compressed in some convenient and suitable manner; (2) a condensing element or condenser, *B*, in which the gas circulates through water-cooled pipes or coils or their equivalent and liquefaction takes place; (3) an expansion element, *C*, consisting of pipes or coils or other space wherein the gas can reëxpand and perform its work of cooling or refrigerating by

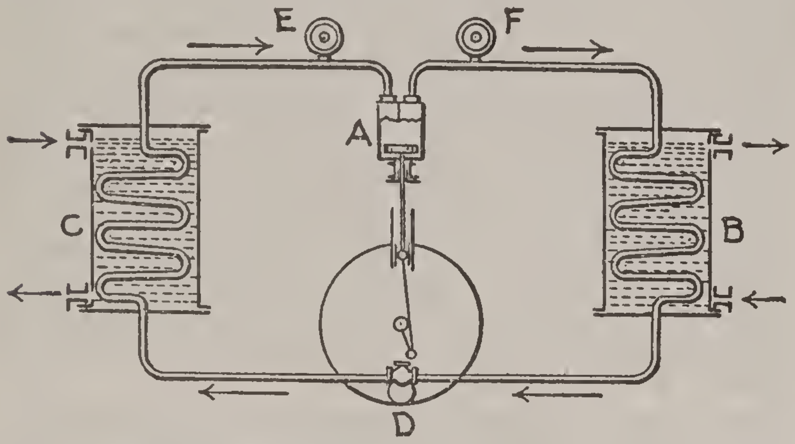


FIG. 1. DIAGRAM ILLUSTRATING THE OPERATION OF A REFRIGERATING MACHINE ON THE COMPRESSION PRINCIPLE.

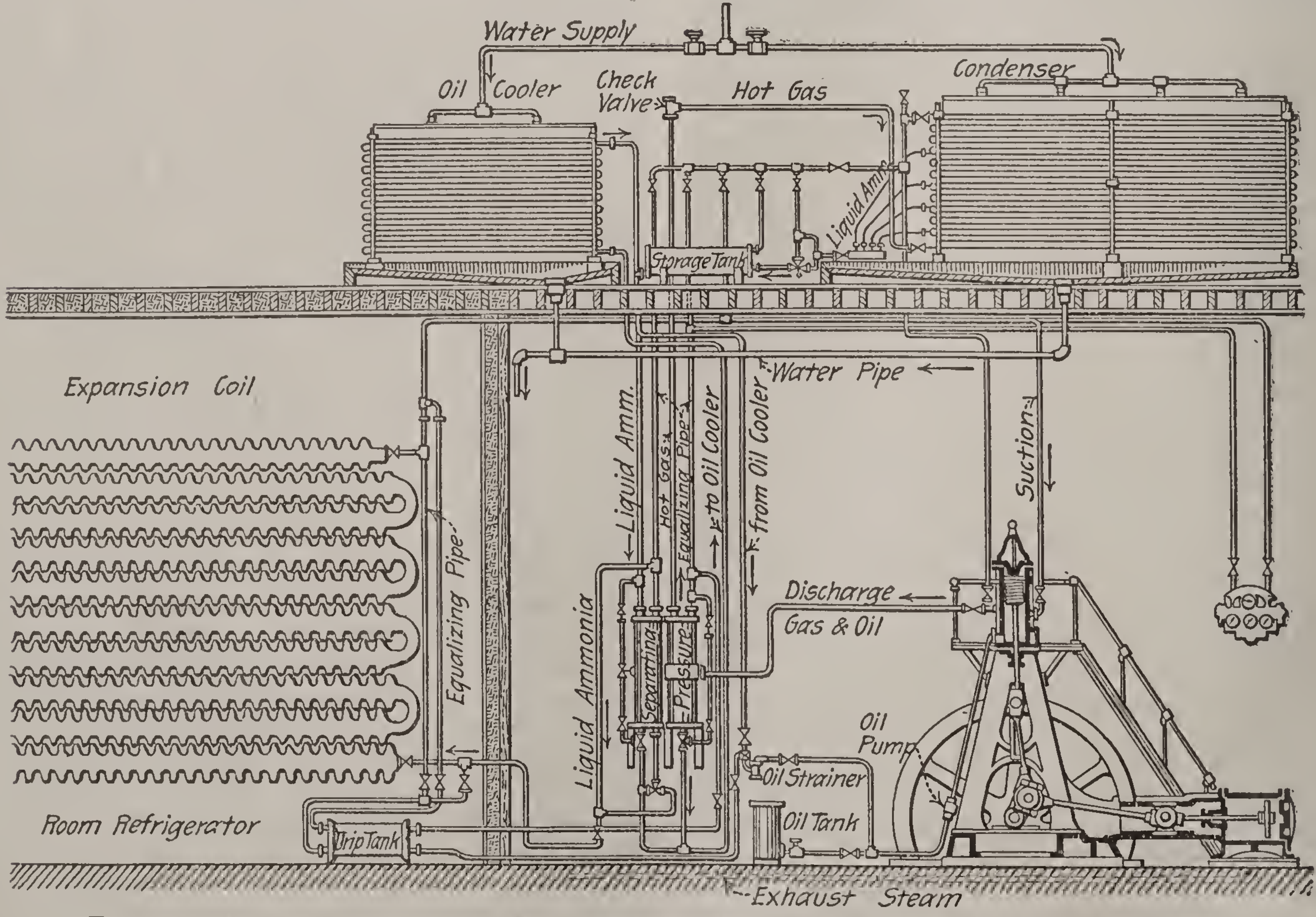


FIG. 2. DIAGRAM SECTION OF A REFRIGERATING PLANT ON AMMONIA COMPRESSION SYSTEM.

abstracting heat from the surrounding objects. In Fig. 1 *D* is a regulating valve, *E* is the low-pressure gauge, and *F* the high-pressure gauge.

Only those liquids are capable of being used as refrigerating agents which possess vapors capable of being liquefied under pressure at ordinary temperatures. There are several such liquids, but those most used in refrigeration are anhydrous ammonia, ether, methyl chloride, sulphurous acid, and carbonic acid. The first compression refrigerating machine was invented by Jacob Perkins in 1834. Subsequent improvements were made by Professor Twining in 1850, by James Harrison in 1856, by Charles Tellier a few years later, and by Van der Weyde, Pictet, and Windhausen at still later dates. The modern refrigerating agent which is most used is anhydrous ammonia, which boils at 40° F. As an illustration of the general compression process and of the machinery and apparatus employed in conducting it, a refrigerating plant on the De La Vergne ammonia compression system may be described. Its characteristic feature consists in the patented system for preventing the occurrence of any leakage of gas taking place past the stuffing box, piston, and valves, and of extracting the heat from the gas during compression by the simple device of injecting into the compressor at each stroke a certain quantity of a special quality oil. Fig. 2 shows diagrammatically a De La Vergne refrigerating plant with all machinery in place. It consists of two sets of apparatus, one set being that required to compress, condense, and expand the ammonia gas and the other set being that required for handling the sealing and cooling oil. Following first the path taken by the ammonia in order to produce the refrigerating effect, there is the compression cylinder, which is of the double-acting type, and the steam-engine cylinder, which is horizontal. The pipe through which the gas is drawn or sucked from the evaporating coils into the compression cylinder is also shown. The gas is discharged by the action of the compressor through the pipe into the pressure tank. From the pressure tank the gas, which still retains the heat due to compression, passes upward through the pipe into the bottom or lower pipe of the condenser, wherein by the cooling action of the cold water running over the pipes the heated gas is first cooled and then liquefied. The ammonia in this liquid condition is then led by the small liquid pipes through the liquid header into the storage tank, whence it flows through into the lower part of the separator, which is constantly maintained at least three-quarters full. By reason of the pressure to which it is now subjected, the liquid ammonia is forced to the expansion cock or valve, through which it is injected into the evaporating or expansion coil which is situated in the room or chamber to be refrigerated or cooled.

The ammonia gas resulting from the expansion and evaporation of the liquid ammonia in the evaporating or expansion coil, having absorbed or taken up the heat from the surrounding atmosphere, passes away back into the compression cylinder, and the cycle of operations just described is again performed. Following now the course of the sealing and cooling oil, which, as previously mentioned, is heated with the gas during compression, this oil is passed from the compression cylinder mingled with ammonia gas into the pressure tank, where most of it separates from the gas and falls to the tank bottom. The heated oil is then conducted through a pipe to the lowermost pipe of the oil cooler, which is similar in construction and operation to the ammonia condenser. After being sufficiently reduced in temperature in the oil cooler the oil flows through the strainer into the oil pump, which is so constructed that it delivers the cooled oil into the compression cylinder, distributing it to either side of the piston or plunger during its compression stroke when it is being compressed and heated. From the compression cylinder the oil proceeds again through the cycle just described. Most of the oil separates from the ammonia gas in the tank, but any small amount that passes on is taken out when it reaches the separating tank. The three salient parts of the apparatus described are the compressor, the condenser, and the expansion coil.

There are numerous compressors of other makes, all of which differ structurally from the De La Vergne and from each other. Condensers are of two general types, surface condensers and submerged condensers. In submerged condensers the pipe coils are submerged in the cooling water; Fig. 3 shows a vertical section of such a construction. In surface condensers the cooling water is simply allowed to trickle from above on to the pipe coils, whence it falls into a basin and is conducted away. The condensers shown in Fig. 2 are of the surface type. Expansion coils are simply coils of pipe of such section as will give a large amount of radiating surface.

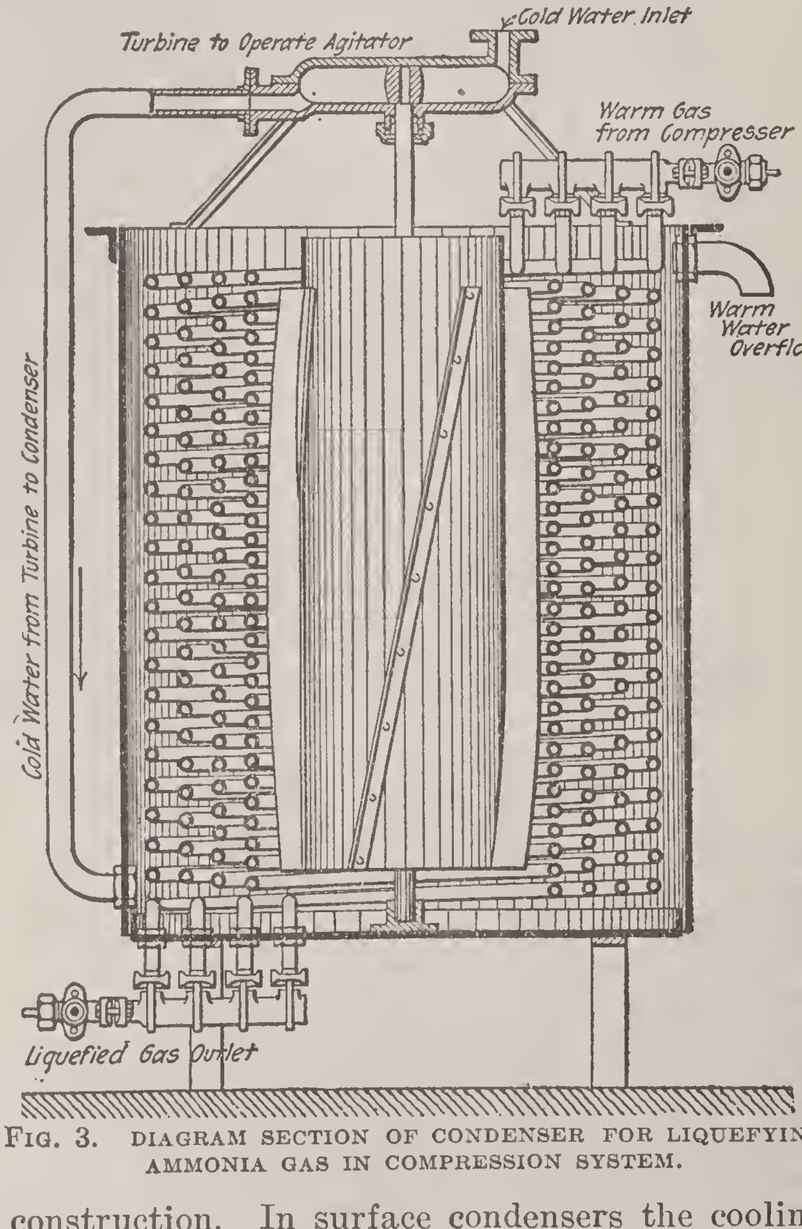


FIG. 3. DIAGRAM SECTION OF CONDENSER FOR LIQUEFYING AMMONIA GAS IN COMPRESSION SYSTEM.

Absorption Process. The absorption process of refrigeration was invented by Ferdinand Carré about the year 1850. It is founded upon the fact of the great capacity possessed by water for absorbing a number of vapors having low boiling points and of their being readily separable therefrom again by heating the combined liquid, hence it is commonly known as the absorption process. The process involves the continuous distillation of ammoniacal liquor and requires the use of three distinct sets of apparatus: (1) a set for distilling, condensing, and liquefying the ammonia; (2) a set for producing cold by means of a refrigerator and absorber, a condenser, a concentrator, and a rectifier; and (3) a pumping plant for forcing the liquor from the condenser into the generator for redistillation. The three operations are each distinct from the other, but when the plant is actually working they must be continuous and are dependent upon one another, forming separate stages of a closed cycle of operations. An advantage of the absorption process is that the bulk of the heat required for performing the work is applied direct without being transformed into mechanical power. For a general explanation of the absorption process the installation shown by Fig. 4 has been selected. Following first the course of the ammonia gas, we start with the generator and analyzer, which are filled with aqua ammonia. This liquor is treated by the steam coil in the generator and the ammonia evaporates, the gas passing through the pipe *A* to the condenser, which is a cylindrical vessel containing a coil of pipe and filled with water. The upper coils of the condenser pipe are provided with drips, *a a*, in which the water vapor which is mingled with the ammonia gas is condensed and led back to the generator by the pipe *B*. The ammonia gas is cooled while passing down the condenser coil and finally liquefies at the bottom and runs through the pipe *C* into the receiver. From the receiver the liquid ammonia is led into the cooler, where it changes into gas and abstracts heat from the coil of brine pipe. The gas then passes to the absorber, where it meets the weak ammonia solution from the generator and is reabsorbed. The liquor is then pumped from the absorber back into the generator, where it is again heated. When the liquor in the generator is released of its ammonia it passes by the pipe *D* into the heater, and thence by the pipe *E* into the absorber, where it meets the ammonia gas from the cooler and reabsorbs it. The cooling or refrigerating is done by the brine which circulates through the cooler. The foregoing description applies in detail only to one make of machine, but the same general process is followed by all machines.

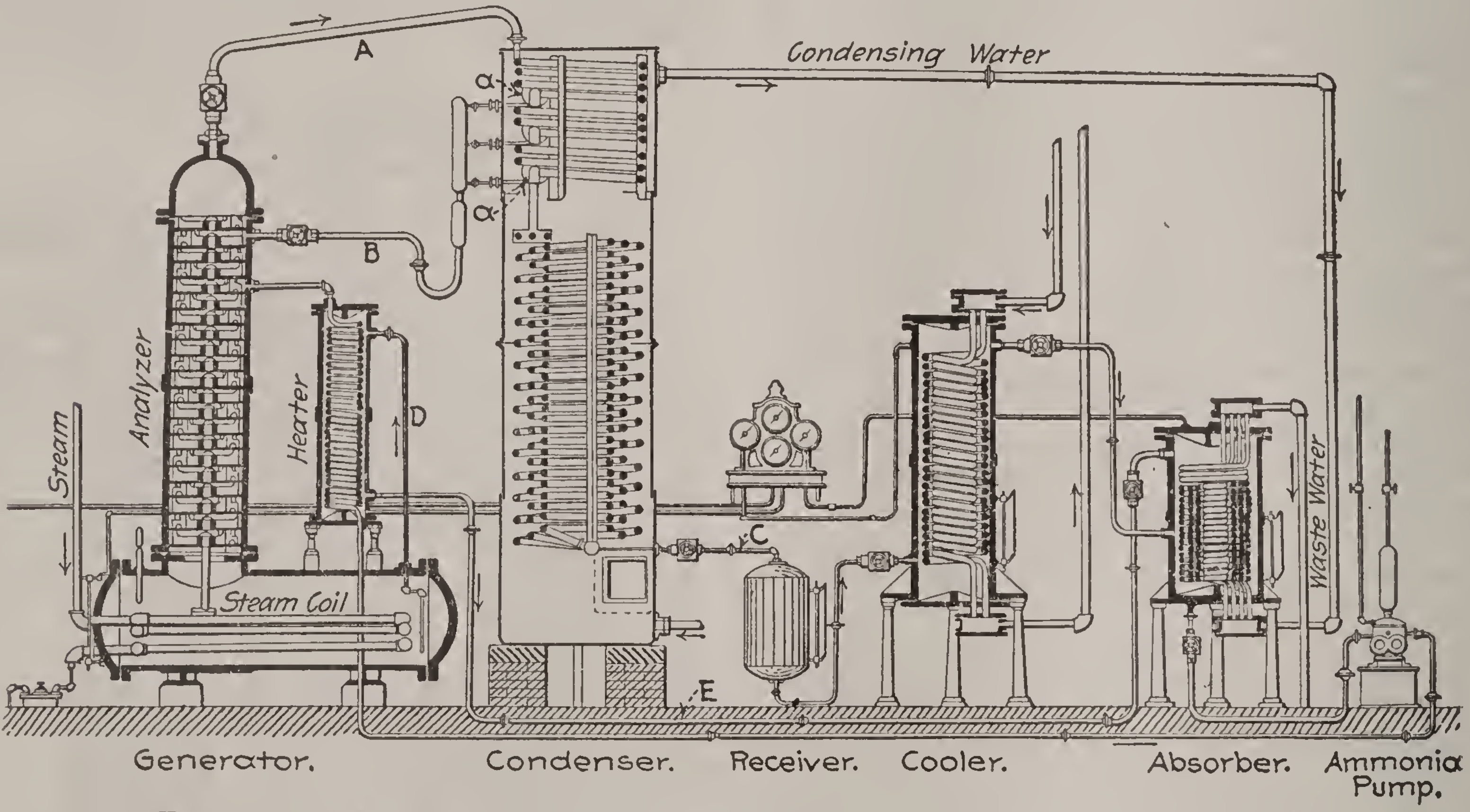


Fig. 4. DIAGRAM SECTION OF REFRIGERATING PLANT IN AMMONIA ABSORPTION SYSTEM.

Cold-Air Process. The cold-air process of refrigeration is based on the principle that the compression of air or other gas generates heat and in its subsequent expansion absorbs heat. The air is first compressed in a cylinder, is then passed through a cooler under pressure, after which it is expanded in a cylinder, the energy of this expansion being used to assist in the compression of the new charge. The great advantages of this system are the absence of all chemicals, its simplicity, and the low temperature that can be obtained. Gorrie is said to have invented cold-air machines and to have designed the first one in 1849. Improvements were made by Alexander Kirk in 1863, by Giffard in 1873, and later by Windhausen, Bell-Coleman, Allen, and others. The greatest difficulties encountered were due to moisture and the clogging of the air ports and valves and to the difficulty of keeping valves tight under the high pressures used.

Water-Vapor Process. One of the recent refrigerating machines is the Westinghouse-Leblanc water-vapor refrigerating machine, which makes use of water vapor and has been found effective for producing temperatures from 35° to 50°, though the former figure is by no means its lowest limit. It is based on the condensation of water vapor.

Cold Storage. A cold-storage plant comprises a refrigerating plant of some kind and a store in which to place the goods, where they can be kept at the desired temperature. Buildings for this purpose vary in size from a single small box or room to large buildings of many stories, containing several rooms in each story. The size of the refrigerating plant varies (*a*) with the size of the store; (*b*) inversely with the temperature to be maintained; and (*c*) with the quality or efficiency of the insulation. The refrigerating processes most used for this purpose are the absorption, the compression, and the cold-air. When the cold-air process is used the air is usually admitted to the store, and after it has taken up the heat there is led back to the compressor. With either of the other processes the refrigeration is effected by one of the following ways: (*a*) by cooling a noncongealable brine, usually a solution of either chloride of sodium (common salt) or chloride of calcium, and then pumping it through coils of pipe in the store; (*b*) by circulating through the store a current of air that is cooled by passing it over surfaces which are cooled directly by the expansion of the refrigerating agent; (*c*) by circulating through the store a current of air cooled by passing over surfaces that are cooled by brine which is cooled by the refrigerating agent; (*d*) by expanding the gas in coils of pipes in the store; this is the direct expansion system; (*b*) and (*c*) are the cold-blast system. To cool the brine it is usually passed through a double-pipe coil, the inner pipe of which contains the refrigerating agent, the brine being circulated through the annular space between the two pipes. A storage tank is generally provided, to which the brine is returned after it has circulated through the coils in the refrigerating chamber. As this brine is extremely cold, it is very essential that any pipes and tanks through which it circulates should be properly insulated wherever they are exposed to heat, except in the refrigerating chamber.

Construction of Cold Stores. Because of the moisture which is always present when temperatures lower than that of the outside air are maintained, materials which are injured by moisture should be used as little as possible. Wooden buildings are not so suitable as those of brick or concrete for this reason, the wood being particularly liable to injury by rotting. To prevent heat from penetrating the walls, floors, and ceilings, these are covered, usually on the inside, with some substance which is a bad conductor of heat. This insulation also should be free from any liability to injury from moisture. It has been found that cork, the bark of the cork oak, is the most suitable substance for this insulation, as it is not injured by moisture and is the best nonconductor of heat known. The amount of insulation required depends on the difference between the temperature of the cold store and the outside air. The greater this difference, the thicker the insulation must be. Temperatures of 10° F. below zero are not uncommon, being sometimes used for the storage of butter. Temperatures ranging from 20° F. to 40° F. are more common, however, meats being usually chilled and stored in about 28° F., fruits and milk at about 34° to 40° F., while fish is kept frozen at from 0° to 10° F. Consult Levey's *Refrigeration Memoranda* (2d ed., Chicago, 1906). Means for the ventilation of cold stores should always be provided. Where a cold-blast system of cooling is used the air may be used over and over almost indefinitely, because the moisture is taken out of the air when it passes over the coils in the refrigerating chamber or bunker room. Most of the impurities and odors are carried by the moisture and are not carried by the dry air. When direct circulation or brine circulation is used separate coils should be installed to furnish fresh cold air when foul air is taken out.

Marine Refrigeration. Marine refrigeration embraces generally the operation of cold stores and ice-making plants on shipboard. These are merely modifications of the plants used on land to adapt them to the special conditions which prevail on shipboard. These conditions are chiefly limited space and the necessity of using a refrigerating agent which is not deleterious to persons or property. To meet the last condition cold-air and carbonic-acid machines offer advantages which have caused them to be very largely adopted. Figure 5 shows a carbonic-acid compression machine designed for use on shipboard. The main point to be noted is the compactness of the arrangement. Figure 6 is a plan of a cold-storage room on a large passenger steamer which is equipped for carrying fresh meats and has machines of the carbon-dioxide type. The refrigerated holds are forward on the lower and orlop decks. On account of the high temperatures outside the rooms into which the holds are divided, they are insulated very thoroughly, and because of the value of space the most efficient insulation is used. The insulation consists of, first, a double course of tongued and grooved boards with a layer of waterproof paper between them, next a course of Nonpareil sheet cork 1¾ inches thick, and over this a layer of paper covered by a course of tongued and grooved boards. The brine cooling pipes are placed partly overhead and partly on the side walls or bulkheads, thus inducing a circulation of the air in each room, which is necessary if the goods are to be carried on a long voyage. The rails for the meat hooks are of 1-inch galvanized iron pipe and are securely fastened to the beams of the deck above. Thermometer tubes from the upper deck are provided to each chamber, so that the temperature may be ascertained in any part of the chamber when desired.

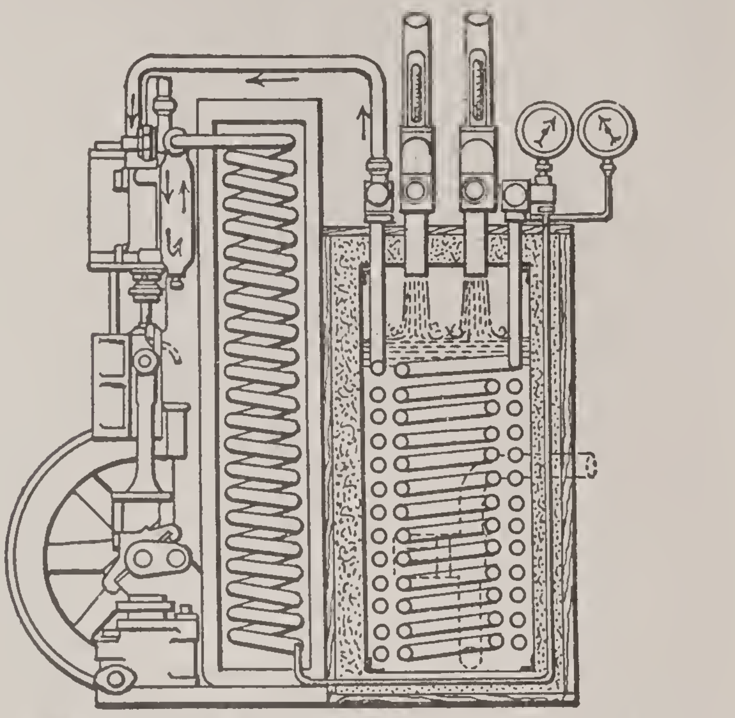


Fig. 5. MARINE TYPE OF CARBONIC-ACID COMPRESSION REFRIGERATING MACHINE.

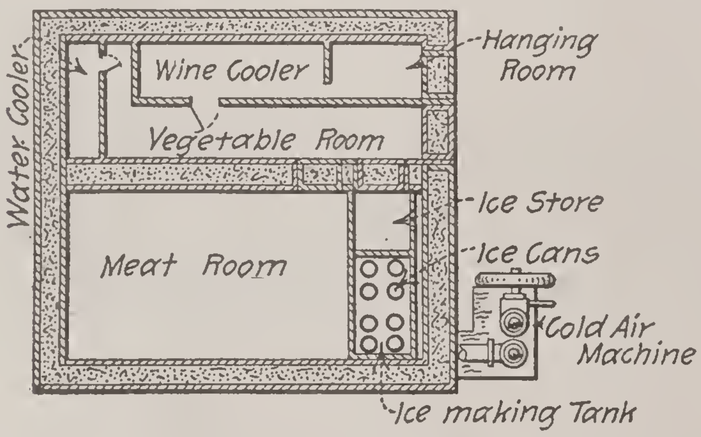


Fig. 6. ARRANGEMENT OF REFRIGERATING PLANT ON LARGE PASSENGER STEAMER.

Ice Making. One of the most important applications of refrigeration is the manufacture of artificial ice. There are several methods of ice manufacture practiced commercially. The great difficulty in manufacturing artificial ice is that of producing a clear, transparent material, for, unless special provisions are made to get rid of it, the air in the water fails to escape, because of the rapid freezing, and an opaque ice containing air bubbles and of inferior keeping qualities is produced. Five methods may be employed for preventing this opacity and forming clear crystal ice: (1) freezing the water slowly at comparatively high temperatures; (2) agitating the water in cans, molds, or cases during the process of freezing so as to admit of the escape of the imprisoned air; (3) forming thin slabs of ice on what is known as the wall or plate system; (4) freezing the water in shallow stationary cells; and (5) deaërating the water before placing it in the molds or cells. Freezing the water slowly at comparatively high temperatures is simply an imitation of the natural process, the water being exposed in well-insulated rooms to an atmosphere cooled below freezing point. The process is too slow to be successful commercially. In the can system, which is one of the most popular, metal cans are set in a tank containing chilled brine and these cans are filled with the water to be frozen. Extending down into these cans is a bar or rod of wood which is given a swinging motion by suitable mechanism, thus agitating the water and facilitating the escape of the contained air. In the plate or wall system the water to be frozen is placed in a large refrigerator tank which is divided into compartments by a series of parallel hollow partitions. In these hollow partitions brine is circulated, causing a sheet or plate of ice to freeze to both sides of each. When these ice plates have frozen to a thickness of 8 to 12 inches, the cold brine is drained from the partitions and replaced by warm brine, which causes the plates to melt loose, after which they are lifted from the tanks and sawed into blocks. The standard size of plate in the United States is 8 × 16 feet × 11 inches. As in the can system agitators are employed to expel the air from the water during freezing. In the stationary cell system a tank, as in the plate system, is divided by both transverse and longitudinal hollow partitions, so that the ice is frozen in rectangular blocks instead of in long flat plates. The methods of freezing and freeing the ice and of agitating the water are the same as in the plate system. In the deaërating system the water to be frozen is either evaporated by boiling, or frozen in a vacuum, or distilled. The vacuum system is but little used. In the other systems the evaporated or distilled water is frozen either by the can system or plate system.

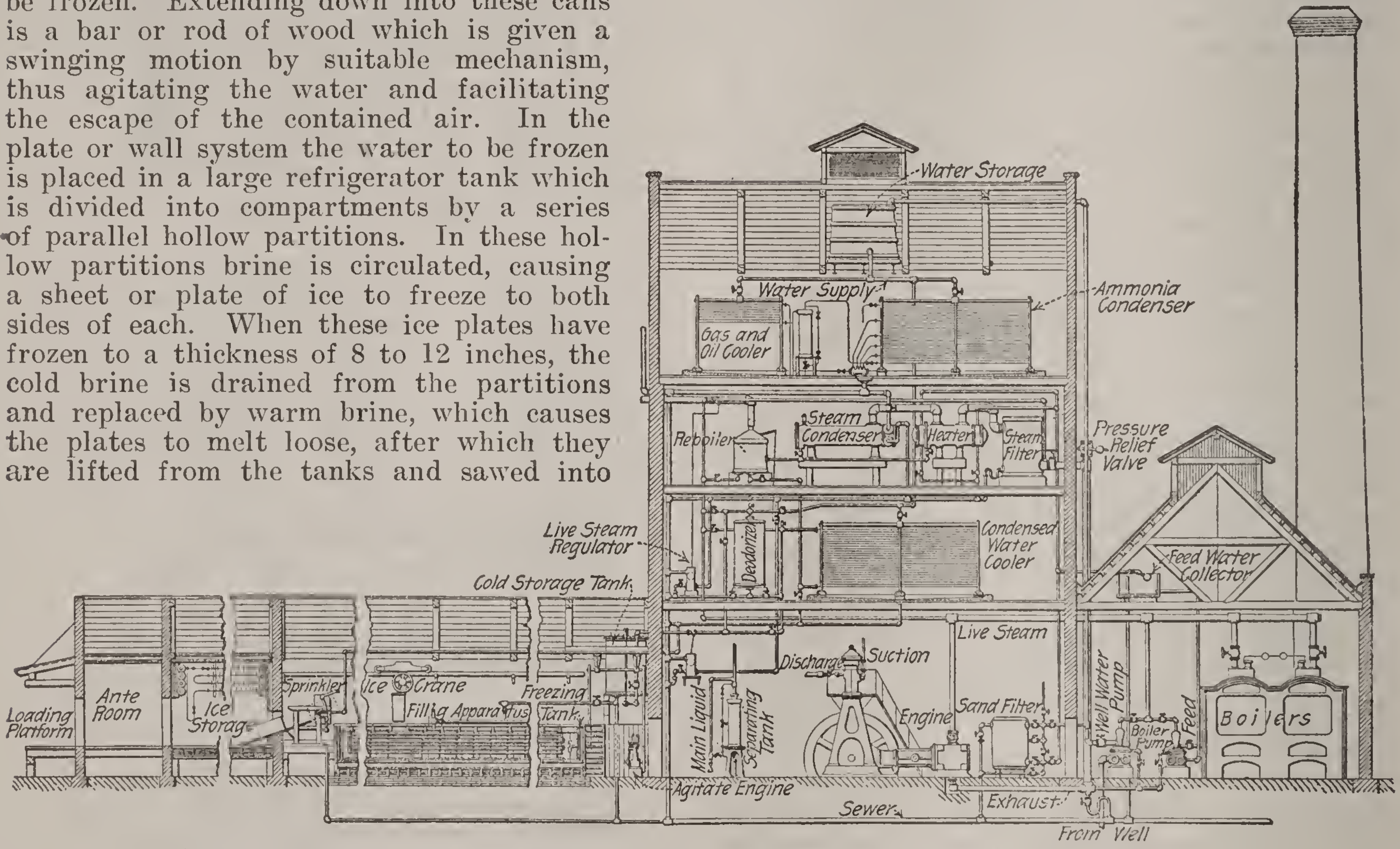


FIG. 7. SECTIONAL DIAGRAM OF ARTIFICIAL ICE-MAKING PLANT; DE LA VERGNE SYSTEM.

Turning now to a specific example of ice making, Fig. 7 shows a plant for making ice on the ammonia compressor can system. The ammonia compressor plant has already been described in a preceding section and will be neglected here. To follow now the water from the well to the loading platform, where it is delivered as ice, we begin with the well-water pump in the boiler house. Water from this pump splits into two currents, one of which rises to the top of the building and discharges into the water-storage tank. This water, as shown by the pipes leading from the tank, flows over the gas and oil cooler and also over the ammonia condenser. From the pans, or cemented floor, on which these stand it flows to the floor below, where it enters the steam condenser. After traversing the condenser it passes through the next floor, runs along the ceiling, and empties into the vertical standpipe (seen to the extreme left) connecting with the sewer. Water from the water storage also flows by a pipe (hidden by the ammonia condenser) to the condensed-water cooler, from the base of which it passes through the floor, runs along the ceiling of the first floor, and empties into the sewer standpipe. This disposes of one current from the well-water pump; the other passes through the sand filter, whence it rises to the third floor and passes through the heater. From this heater it again descends to the feed-water collector in the boiler house, whence it is drawn off by the boiler-feed pump, and by it sent into the boilers. It leaves the boilers in the form of live steam. The pipe conveying this live steam has branches supplying the engine, the well-water pump, the boiler-feed pump, and is continued along the ceiling of the first floor, rising to the third floor, where it is connected with the reboiler and also the steam filter. The purpose of its connection with the reboiler is apparent; the connection with the steam filter is utilized to supply automatically a small quantity of live steam to make up for any deficiency in exhaust steam. Other connections of the live-steam pipe to the various apparatus are shown, which are used for cleaning out. The exhaust steam from the engine, and also for the two water pumps, passes beneath the first floor and rises through the boiler room and outside the main building to the third floor. Before it enters this it has a chance to escape through the pressure-release valve if for any reason the various apparatus through which it passes should cause sufficient back pressure to impair the proper working of the engine. The exhaust steam passes first into the steam filter, thence into the heater, where it heats the water, which as we have already seen passes through this same heater on its way to the boiler. From the heater it passes to the condenser, thence to the reboiler. From this it goes through the condensed-water cooler to the deodorizer on its way to the cold-storage tank. From the cold-storage tank water is fed by a hose in any can whose place may be rendered vacant by the withdrawal of a can of ice. There we must leave the now thoroughly purified and distilled water in repose for some 60 hours. After this interval of time the can is lifted by the ice crane suspended from the carriage on which it is run down the tank room to the sprinkler. In the sprinkler the can receives a shower bath of warm water and the ice when loosened drops out of itself and glides into the ice-storage room. This ice-storage room is seen to be supplied with refrigerating pipes, so that if the demand is fluctuating the blocks will be preserved intact, only so much being withdrawn into the anteroom as is necessary for immediate use. The following table shows the structural sizes and weights of blocks made by the can system:

WEIGHT OF BLOCKS	Size of can, inches	Time of freezing*
50 pounds..............	6 × 12 × 26	15 to 25 hours
100 "	8 × 16 × 32	30 " 50 "
150 "	8 × 16 × 42	30 " 50 "
200 "	11 × 22 × 32	50 " 72 "
300 "	11 × 22 × 44	50 " 72 "
400 "	11 × 22 × 57	50 " 72 "

* The time of freezing is with 18° F. brine.

Manufacturing. In general it may be said that refrigeration is applied to all processes of manufacturing where it is desirable or necessary to have at some period a temperature below the normal atmospheric temperature. Some of these processes are brewing, chocolate making, dynamite manufacture, India-rubber manufacture, sugar making, and chemical making. The method of application varies with the process, but it is in general simply a modification of refrigerating processes as applied to cold storage and ice making. See ICE INDUSTRY; LIQUEFACTION OF GASES.

Bibliography. Wallis-Taylor, *Refrigeration, Cold Storage, and Ice Making* (3d ed., New York, 1912); F. E. Matthews, *Elementary Mechanical Refrigeration* (ib., 1912); J. J. Crosgrove, *Sanitary Refrigeration and Ice Making* (Pittsburgh, 1914); A. J. Wallis-Taylor, *Pocket-Book of Refrigeration and Ice Making* (6th ed., New York, 1914); H. J. Macintire, *Mechanical Refrigeration* (ib., 1914); M. Cooper, *Practical Cold Storage* (2d ed., Chicago, 1914); and current files of *Ice and Refrigeration* (Chicago, monthly).

REFRIGERATION OF THE EARTH. That the earth is radiating more heat into space than it receives is evidenced by the fact that the temperature rises as the crust of the earth is penetrated. The flow of heat is always from a higher to a lower temperature, and consequently there is a constant conduction of heat from the interior to the surface of the earth and a loss into space. Determinations of the increase in temperature as the earth's crust is penetrated show that there is a marked variation from one locality to another, this variation depending upon the character of the rocks penetrated, the amount of disturbance they have undergone, and other local conditions. In the well at Wheeling, W. Va., which has a depth of 4500 feet, the rise in temperature has been found to be 1° F. for each 75 feet of descent; in the well at Sperenberg, Prussia (depth 4170 feet), the increase is 1° for 59 feet; and in the Schladabach well, near Leipzig (depth 5740 feet), the increase is 1° for 65 feet. At other localities the rate varies from 15 to 200 feet for 1° F.

Various causes have been suggested for this interior heat of the earth, but considering all the related astronomical and physical considerations it is most probable that it is a remnant of the original nebular heat which has not yet been dissipated and which has been prolonged by the results of the condensation from the nebulous state. By the phrase "age of the earth" is usually understood the time since the earth became practically solid and the present method of cooling by conduction commenced. From data as to the conductivity of the rock materials and the rise in temperature it is possible to make certain estimates as to the age of the earth. Lord Kelvin first made use of this method and concluded that the earth was not less than 20,000,000 nor more than 400,000,000 years old. Later he revised the estimate, placing the limits at 20,000,000 and 40,000,000. Clarence King in an independent investigation concluded that about 24,000,000 years had elapsed since the earth was molten. A later study of the problem was by Becker, who applied the more recent investigations of the involved factors and found that the results point to an age of 60,000,000 or 65,000,000 years, a conclusion that is more nearly in agreement with the views expressed by geologists. It is thought by some physicists that the loss of heat by conduction may be counterbalanced to some extent at least by the influence of radioactive minerals, but it is probable that their influence is limited to the outer shell, in which the acid rocks predominate. Consult Becker, "The Age of the Earth," in *Smithsonian Miscellaneous Collections*, vol. xcvi (Washington, 1910).

REFUGE, CITY OF. See CITY OF REFUGE.

REFUNDERS. See READJUSTERS.

REFUNDING (from *refund*, OF., Fr., *refondre*, to restore, pay back, remodel, from Lat. *refundere*, to pour back, restore, from *re-*, back again, anew + *fundere*, to pour). A financial operation by which a government or corporation changes the terms of an existing debt. In public finance the term is used synonymously with "conversion." A government may refund its debts to secure a change of terms either with respect to rate of interest or with respect to time of payment of principal. Refunding almost always implies a reduction in the rate of interest. An apparent exception to this rule appears in connection with British borrowings of 1915. Subscribers to the new 4½ per cent loan were permitted to refund an equal volume of securities bearing a lower rate into 4½ per cent bonds. Public debts are usually created at a time when public credit is low; accordingly a high rate of interest must be offered to tempt investors. With the restoration of credit it becomes possible for the government to borrow money at a lower rate of interest; and if the terms of its original debt permit, it is good financial policy to pay off that debt with money borrowed at the lower rate. In practice the holders of the old obligations usually exchange them for the new, so that a refunding operation changes neither the principal of the debt nor the creditors to whom it is due, although technically a new debt has taken the place of the old one.

Quite apart from improvements in public credit, the rate of interest at which a government can borrow money tends constantly to decline owing to the general fall in the rate of interest. Most modern governments are burdened with a more or less permanent debt; accordingly their recent history shows a series of refunding operations, resulting in a steady decline of interest on public debentures. The policy of refunding of debts, while justly popular, naturally meets with the hostility of public creditors, who have at times been powerful enough to influence the action of the government, as in France, 1878–83, when the government could have replaced obligations bearing interest at over 6 per cent by obligations bearing interest at less than 4. The public obligations were largely in the hands of small holders, whose political influence deterred the ministry from undertaking the operation.

Refunding can take place advantageously only when government debentures are above par on the market. It is therefore bad policy for a government in need of funds to sell low-interest bonds below par, since such a policy prevents it from taking advantage of a fall in the rate of interest. See Debt, Public; Finance; and the financial sections under the various countries.

REFUSE DISPOSAL. See Garbage and Refuse, Disposal of.

RE′GAL (OF., OIt. *regale*, Fr. *régale*, from Lat. *regalis*, regal, from *rex*, king). A small portable finger organ in use in the sixteenth and seventeenth centuries and perhaps earlier. The pipes rested on the air chest, which was filled by the bellows. Its compass was about four octaves, from e to c^3. It occupied about the same position as the modern harmonium (q.v.), of which it was really the precursor. The musical collection of Henry VIII contained 13 regals. The name continued in use as late as 1770.

REGALBUTO, rā′gȧl-bo͞o′tȯ. A town in Sicily, 26 miles west-northwest of Catania. Salt and sulphur are mined and there is a trade in cereals and wine. Pop. (commune), 1901, 11,038; 1911, 13,614.

REGALDI, rȧ-gäl′dė, Giuseppe (1809–83). An Italian poet, born at Novara. He studied law at Turin, but upon hearing Giustiniani resolved to become, like him, an *improvisatore*, and from 1833 until 1836 traveled much in that capacity and with considerable success. His political opinions, expressed with fire and frankness, involved him in difficulties with the authorities of various Italian towns, and for a time he traveled in the East and in Greece. At the time of his death he was professor of history at the University of Bologna. His works include: *La guerra* (1832); *Poesie estemporanee e pensate* (1839); *Canti* (1840); *Canti nazionali* (1841); *Canti e prose* (1861–65); *Storia e letteratura* (1879), essays. Consult Ettore Stampini, "Giuseppe Regaldi," in Reale Accademia delle Scienze, *Atti*, vol. xlv (Turin, 1910).

REGA′LIA (ML., royal prerogatives), or Regale, Right of. A right in ecclesiastical things, claimed by sovereigns in virtue of the royal prerogative, which has frequently been the subject of controversy between kings and popes, especially in the twelfth and thirteenth centuries, in Germany and France. It involved several points as to presentation to benefices, most of which formed the object from time to time of negotiation by concordat; but the most serious conflict arose out of the claim made by the crown to the revenues of vacant benefices, especially bishoprics, and the coördinate claim to keep the benefice or the see vacant for an indefinite period in order to appropriate its revenue. (For the general history of the controversy, see Investiture.) The specific term *Droit de régale*, however, recalls mainly the conflict in France between Louis XIV and certain French bishops, notably those of Alet and Pamiers, who were supported by the Pope, Innocent XI. For a detailed history of this particular strife, consult: Charles Gérin, *Recherches historiques sur l'assemblée du clergé de France de 1682* (2d ed., Paris, 1870); G. J. Phillips, *Das Regalienrecht in Frankreich* (Halle, 1873); E. Michaud, *Louis XIV et Innocent XI* (4 vols., Paris, 1883). (See Gallican Church.) The controversy was revived in essence under the French Republic from 1880 to 1906.

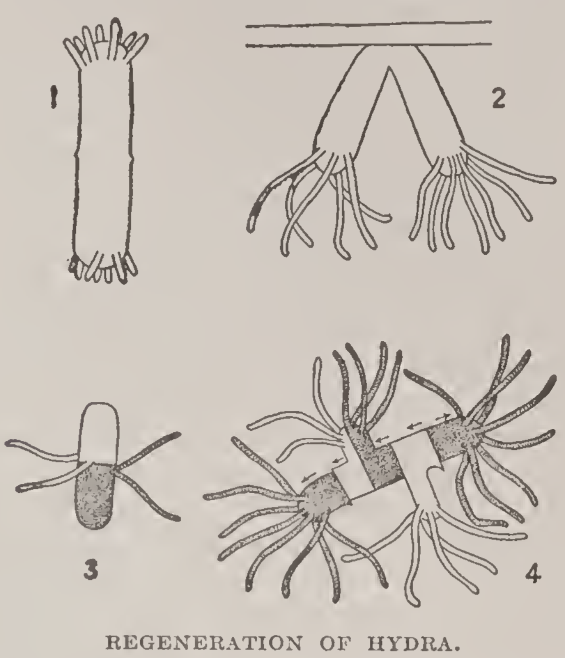
REGARD′ANT (OF., looking). A term used in heraldry (q.v.) with reference to an animal whose head is turned backward.

REGEL, rā′gel, Eduard August von (1815–92). A German-Russian botanist, born in Gotha, where he received his horticultural training. He was then employed in the botanical gardens of Bonn, Berlin, and Göttingen. In 1842 he became director of the botanical gardens in Zurich and lecturer at the university there. In 1855 he was made director of the Imperial gardens in St. Petersburg. He did much to promote fruit culture in Russia. His numerous printed works on botany include *Flora Bonnensis* (1841); *Allgemeines Gartenbuch* (1855–58); *Descriptiones Plantarum Novarum in Regionibus Turkestanicis Collectarum*, (1873–82); *Aliorum Adhuc Cognitorum Monographia* (1877); *Anlage von Gärten* (1879).

REGEL, (Christoph) Fritz (1853–). A German geographer, born at Schloss Tenneberg, near Waltershausen, Gotha. He studied at the University of Jena and taught in secondary schools in Lippstadt, Brunswick, and Jena. In 1884 he became docent and in 1892 professor of geography at the University of Jena; in 1896–97 he traveled in South America, especially Colombia; and in 1899 he became professor of geography at Würzburg. Regel wrote several books on the geography of Thuringia, notably *Thüringen: ein landeskundlicher Grundriss* (1897) and *Landeskunde von Thüringen* (4th ed., 1913); a good deal on Spanish America, especially "Kolumbien" (1899), in the *Bibliothek der Länderkunde*, and *Argentinien* (1913); on commercial geography, *Handelsgeographie* (1912), based on Von Schöning.

RE′GELA′TION (Lat. *regelatio*, a thawing, from *regelare*, to thaw, from *re-*, back again, anew + *gelare*, to freeze, from *gelu*, frost; connected with Lith. *geluma*, intense cold, Goth. *kalda*, OHG. *kalt*, AS. *ceald*, Eng. *cold*). A term first applied by Faraday to describe the phenomena occurring when two pieces of ice are brought into contact under pressure. The ice melts at the plane of contact and the water thus formed freezes when the pressure is relieved, thus uniting the two pieces. That ice melts with pressure and that its melting point is lowered as the pressure increases was first shown by Prof. James Thomson and then demonstrated experimentally by his brother, Lord Kelvin, and this property serves to explain the phenomena involved in regelation. A wheel track in the snow is generally covered with a thin film of ice for the reason that the snow melted by the pressure of the wheels freezes as soon as the pressure is removed. A snowball is made by the pressure of the hands causing the snow to melt and then the water is solidified. Consequently if the snow is dry and cold and below the freezing point, the pressure of the hands will not suffice. The well-known experiment of looping a cord or wire around a block of ice and attaching a weight will also show regelation. Here the pressure on the cord melts the ice and allows the string to cut its way through the block, but at the same time the water thus formed is again frozen and the block left in its original solid condition. A union between two pieces of ice will take place when they are in contact under water, even if the temperature is considerably above that of the air. In such a case, however, the capillary action of the film of water between the two faces renders the internal pressure less than the external and acts to bring the two pieces together with pressure. The phenomenon of regelation is also quoted to explain the formation and movement of glaciers. The glacier (q.v.) in its progressive movement acts much as a viscous solid, the top moving faster than the bottom and the middle faster than the sides. The pressure of the vast quantity of snow above melts the ice or snow at the bottom, and this, escaping and flowing down, freezes and solidifies, a gradual slipping away of the base occurring. As the foot of the glacier descends it reaches warmer regions, so that melting will take place with less pressure and the water will drain off. In this way it is possible to explain much of the formation and movement of glaciers, though of course the problem is very complex and other causes exert powerful influences. Consult Thomas Preston, *Theory of Heat* (2d ed., New York, 1904). See HEAT.

REGEN'ERA'TION (Lat. *regeneratio*, from *regenerare*, to generate anew, from *re-*, back again, anew + *generare*, to beget, from *genus*, family). Replacement of lost parts, renewal of organs, or completion of an organism from a part. In 1744 the Swiss naturalist Trembley found that on cutting hydras in two, or slicing them into thin rings, from each ring grew out a crown of tentacles; and in splitting them into longitudinal strips each portion became a well-shaped hydra. Finally he turned one inside out and in a few days the evaginated hydra swallowed pieces of meat, though its former stomach lining had now become its skin. Bonnet found that from the same region of a worm, like the earthworm, a head or tail may arise according to whether that region happens to lie at the anterior or posterior end of the cut surface. Thus, if a worm (*Lumbriculus*) be cut into two pieces, a new tail will develop from the posterior end of the anterior piece and a new head from the front end of the posterior piece. In another species of fresh-water annelid Bonnet found that a new tail developed at the anterior end of the posterior piece, and not a head. As the result of recent experiments on the earthworm it is ascertained that if from one to five of the anterior segments be cut off, the same number come back; if more are cut off, the process of regeneration begins only after a longer interval, and only four or five segments come back as a rule; if the cut be behind the middle, the time before regeneration begins is still longer, and fewer worms succeed in regenerating at all. Each end of the body can regenerate in its own direction only.



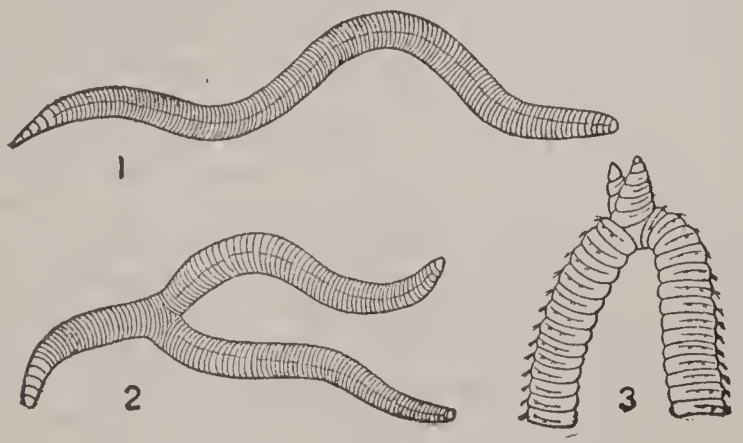
REGENERATION OF HYDRA.

1, two anterior pieces of hydra united by their aboral ends; 2, hydra split in two, hanging vertically downward; 3, two posterior ends of hydra united by oral surfaces; 4, five pieces united as shown by arrows. (After Morgan.)

The effect produced by external factors in experiments on regeneration is noteworthy. A hydroid (*Eudendrium*) failed to develop new heads when kept in the dark, but when placed in the light the new heads quickly appeared, showing that light acts as a stimulus; and instead of a head a root will develop at the distal end of a piece if that end be brought into contact with some fixed object, and conversely a new head will appear at either the nearest or farthest end if the end be freely surrounded with water; in this case the external agent is the stimulus which determines the differentiation of the part; and experiments have produced some extremely curious manifestations of how this stimulus acts.

It is of some theoretical interest to know whether the old cells directly form the new tissue or whether reserve cells are present that bring about the result. From experiments thus far made Morgan thinks that this may vary with different forms. In *Planaria*, a flatworm, a new head forms on the anterior end of the posterior half of the worm, but the entire anterior half is never replaced by new tissue. In this same planarian Randolph has discovered a most important relation existing between the old and the new parts. If a planarian be cut in two longitudinally in the median plane, the right half regenerates a new left half of the same size as the part removed, and the left half also develops a new right half of corresponding size. If, however, the worm be cut longitudinally into a larger and a smaller strip, the former replaces as much as was contained in the smaller part removed, but the smaller part does not develop the lost larger part, but forms only as much new tissue at its cut side as is about equivalent to its own breadth.

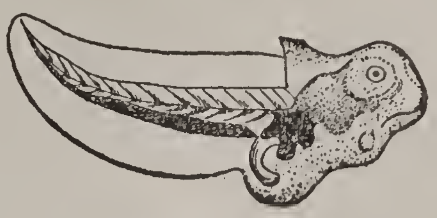
Animal Grafting. Although this subject is not one of practical importance as regards animals, it is a matter of interest connected with the regeneration of the grafted parts, and in the case of the lower animals may lead, if portions of different species or genera are grafted upon each other, to results bearing on heredity. The first experiments in animal grafting are the famous experiments with the hydras by Trembley. He found that if a hydra is cut in two, the pieces can be reunited by their cut surfaces, the result being a complete animal. He also successfully united the head end of one hydra with the posterior half of another; but he failed to obtain a permanent union between individuals of different species. Lateral grafts were found to differ from lateral buds, the latter after four or five days separating by constricting at the base. Peebles succeeded in grafting in *Tubularia*, *Hydractinia*, etc. Joest has succeeded in grafting earthworms, producing double-headed and double-tailed specimens, also in splicing, making a long worm out of three separate pieces; he grafted or spliced together with such success worms of different species, and even of different genera (*Lumbricus rubellus* and *Allobophora terrestris*), though it was a more difficult undertaking; but the new worm "reacted as a single individual, and lived for eight months." As to more specialized animals, as insects and vertebrates, it appears that as in Crampton's experiments with grafting the pupæ of silk moths (*Philosamia cynthia*, *Samia cecropia*, etc.), like tissues of two components fuse with like, while unlike tissues become organically united by connective tissues. He grafted small pieces upon entire pupæ, *Philosamia cynthia* upon *Samia cecropia*, *Callosamia promethea* upon *Samia cecropia*, but the fusion was entirely a superficial one, there being no internal connection between the organs of the graft, such as the muscles of the legs with those of the stock. Tandem unions were more successful, a pupa deprived of the head and part of the thorax being joined to another deprived of its abdomen back of the fourth segment. The moths thus resulting had a long body with two sets of wings and legs, yet there was no internal fusion of organs, only the skin and appendages and wings sharing in the fusion. Twin unions were produced by aboral and oral poles, also lateral twin unions; these experiments were easily performed because only a little of each component was cut away.



REGENERATION OF WORMS.

1, union of two pieces of *Allobophora terrestris* in normal position 22 months after operation. 2, piece of *Lumbricus rubellus* grafted on side of body of another individual to produce a double-tailed worm. 3, union of two worms (by anterior ends) from each of which eight anterior segments had been removed. (After Morgan.)

The grafting of tadpoles by Born (1896–97) has excited much interest. If the anterior half of one tadpole was fused with the hinder half of the same or another tadpole, a single individual was formed which was kept alive in several cases until the time of metamorphosis. If the head of a tadpole is cut off and grafted upon the side of the body of another tadpole, the head will remain alive and continue to develop in its new position, and may grow to the size of that of the stock. He succeeded in uniting tadpoles of different species in several different ways, i.e., by their heads or by their ventral surfaces, or longer and shorter tadpoles were made by using pieces longer or shorter than a half. In all these cases there was no regeneration (says Morgan) at the place of union, and the internal organs, the digestive tract, nervous system, and blood vessels unite when brought into contact. When like organs are brought together the substance of one unites directly with the substance of the other, and if the organ is a hollow one, as is the digestive tract or the nerve cord, their cavities also become continuous. Born succeeded in grafting tadpoles even of different genera. It should be observed that in all these and other combinations each developing part retains its specific characters, "and although in several cases one part received its nourishment from the other through the common circulation, yet no influence of one component on the other could be observed." Morgan states that in the mammals it is impossible to carry out grafting experiments on the same scale as those described in lower forms. Thus, we could not graft an arm of a man upon another. While the tissue might have the power to unite, the difficulty would be in supplying the grafted arm with nourishment, etc., during the long time required for the union to take place. Yet smaller parts of the body may be successfully grafted, and there are, he says, several recorded instances in which parts of a finger, or of the nose, are said to have been cut off and to have reunited after being quickly put back in place. As regards cases of grafting, Hunter and also Duhamel grafted the spur of a young cock upon the comb, where it continued to grow to its normal size. Other similar experiments have met with varying success.



GRAFTING A FROG.

A combination in which the anterior part of *Rana esculenta* was united to the posterior part of *Rana larvalis*. The blood of the posterior component was driven through the vessels by the action of the heart of the anterior component. The animal lived for 17 days. (After Morgan.)

Transplantation of Skin. Cases of this sort of plastic surgery are becoming frequent. Morgan states that pieces of human skin may be without great difficulty grafted upon an exposed surface, "and it has been said that small pieces succeed better than large ones, owing, most probably, to their being able to absorb sufficient oxygen, etc., and keep alive until new blood vessels have grown into the grafted piece." The skin of the negro has been transplanted upon a white man. In many cases the transplanted skin has remained alive for a time, yet later it was thrown off by new skin growing under it and replacing it. Even grafting of internal organs is now attempted with more or less success in operative surgery. The results of grafting bone, etc., show, adds Morgan, that all kinds of tissue may continue to live, and the cells multiply in different parts of the body, but there seems to be nothing in these cases comparable to a regeneration of the entire organ. In the new situation the cells often assume an entirely new arrangement. After a period of activity a process of degeneration commences and the piece atrophies. See Rhinoplastic Operation; Skin Grafting.

Bibliography. T. H. Morgan, *Regeneration* (New York, 1901), containing a full bibliography; Jacques Loeb, *Studies in General Physiology* (2 vols., Chicago, 1905); id., *Dynamics of Living Matter* (New York, 1906).

REGENERATION. A term used in theology to indicate either the new spiritual life of men when they become Christians or the divine agency which produces that new life. The words of Christ to Nicodemus, "Verily, verily, I say unto thee, except a man be born again, he cannot see the kingdom of God," are accepted as the statement of the universal necessity of regeneration and are the origin of the figure which the term expresses. In the view of the Roman Catholic and Eastern churches and of the High Church school among Anglicans, the change is inseparably connected with baptism, always in the case of infants and of those adults who interpose no obstacle to divine grace. In this view baptism constitutes always a real point of transition from the natural to the spiritual life, so that every baptized person—or at least every rightly baptized person—has already become a Christian, although he may fall away from the grace that he has received. According to most Protestants regeneration (including conversion) is a special, conscious process which takes place independently of baptism or of any other outward fact or ceremony. It implies a sensible experience—an awakening whereby men come to see the evil of sin and the divine displeasure against sin and, through the Holy Spirit, are born again, put away their former evil life, and begin to live a new, divine life. The controversy as to the meaning and method of regeneration was especially acute in the Anglican communion in the nineteenth century. The Gorham Judgment (see Gorham Controversy) agitated the entire Church of England in the forties. Present thought is largely occupied with the experiences of the new religious life and their psychological causes, rather than with theories of their divine origin. Consult: G. S. Faber, *The Primitive Doctrine of Regeneration* (London, 1840); W. Anderson, *Treatise on Regeneration* (2d ed., Philadelphia, 1871); G. T. Fox, *Doctrine of Regeneration* (London, 1880); Albrecht Ritschl, *The Christian Doctrine of Justification and Reconciliation*, English translation by Mackintosh and Macaulay (New York, 1900).

REGENERATION, in Plants. In general when a portion of a plant is removed the plant replaces it with a similar or different part. This process of replacing a lost organ is called regeneration. In more complex plant bodies regeneration may occur in either of two ways: (1) the removed part may be formed directly from the cut or broken surface without the intermediate development of wound tissue or callus, or (2) it may develop from callus or previously formed primordia in the general region of the wound. The first type of regeneration is often called restitution. Reparation is also sometimes used to cover this type of generation. In fact, various authors differ considerably in the meaning given to the three words "regeneration," "restitution," and "reparation." The latter type of regeneration mentioned above is the far more common method, but restitution is also of rather frequent occurrence. When 0.5 millimeter of the root tip, the lateral half of many vegetative organs, or a portion of the leaf of Gesneriaceæ is removed, it is replaced by restitution. If a greater portion of the primary root is removed, a lower lateral root primordium becomes radial, grows downward, and acts as a primary root. The very general phenomena of shoots regenerating shoots or roots and of roots regenerating shoots, leaves, and roots involve callus formation or development of primordia already existing. Such primordia may be visible to the naked eye or only to the microscope or to neither.

Propagation by cuttings is much used by florists and horticulturists. The process is, of course, limited to those plants having considerable capacity of regeneration, and this capacity varies greatly with different plants. On one extreme are those incapable of reproducing by cuttings and on the other those that will regenerate from a fragment of the leaf, as *Begonia*. Under certain conditions *Bryophyllum* will produce new plants at the vein tips of the leaves, even when the leaves are still intact.

Restitution of lost parts occurs even in filamentous plants showing basal and apical regions. In *Cladophora* the separation of the individual cells causes each cell to develop a rhizoid at its base and a new green cell at its tip. This is a method of substituting for the lost parts of the filament. The power of individual cells to behave thus is common in thallophytes, but rather limited in higher forms, due in part to specialization introducing nutritive and other difficulties. This ability of individual cells to replace lost parts leads physiologists to conclude that in each protoplast there once dwelt the ability to form an entire plant of the same species. If such capacity existed it would not be realized unless the cells were separated, because of correlations (q.v.) existing between cells and groups of cells. With time and specialization many plant cells have lost this capacity; indeed, many plants have lost the capacity to regenerate even from large portions of themselves, as was mentioned above. Regeneration is always intimately connected with correlations and polarity. Several other examples of regeneration are discussed under these topics. Consult Jost, *Lectures on Plant Physiology*, English translation by R. J. H. Gibson (Oxford, 1914).

REGENSBURG, rā′gĕns-bo͞ork, or Ratisbon. A city of Bavaria, Germany, capital of the Upper Palatinate, situated on the Danube opposite the mouth of the Regen, 65 miles north-northeast of Munich (Map: Germany, E 4). It is distinctly mediæval in appearance, with narrow, crooked streets and ancient houses with loopholed towers and coats of arms. A stone bridge dating from the twelfth century connects Regensburg with the suburb of Stadtamhof on the opposite bank of the Danube. The cathedral, begun in 1275 and completed in 1524 with the exception of the towers, is pure German Gothic. It contains many fine monuments and other objects of art. The church of St. Ulrich, dating from 1250, contains a valuable historical collection. The Rathaus, dating partly from the fifteenth century, is interesting as the seat of the Imperial Diet from 1663 to 1806. Another building of historical interest is the inn Zum Goldnen Kreuz, where Charles V lodged during the Diet of 1547 and where he met Barbara von Blomberg, the mother of Don John of Austria. The villa of the King of Bavaria is a magnificent building in the Gothic style, commanding a fine view of the surrounding country. There are a number of seminaries and schools of religious music, glass painting, and agriculture. Interesting collections are owned by the local historical and natural-history societies. There are manufactures of paints, porcelain ware and pottery, machinery and other iron and steel products, knit goods and cloth, musical instruments, rifles, spirits, etc. Boat building and book printing and binding are also industries of importance. Pop., 1900, 45,426; 1910, 52,624, principally Roman Catholics. Near Regensburg is the German Temple of Fame, called the Valhalla (q.v.).

Regensburg was the Celtic settlement of Radasbona, called by the Romans Castra Regina. It was the residence of the early dukes of Bavaria and became the seat of the bishopric of Regensburg in the eighth century. From the eleventh century to the close of the Middle Ages Regensburg was one of the most important cities of south Germany and carried on a flourishing trade with the East. It was early raised to the position of a free Imperial city. As the frequent residence of the German emperors Regensburg was the scene of many important diets, and became the permanent seat of the Diet in 1663. In the territorial changes following the Treaty of Lunéville in 1801 it was assigned to Dalberg (q.v.). In 1810 it passed to Bavaria. Consult: Gumpelzhaimer, *Regensburger Geschichte, Sagen und Merkwürdigkeiten* (Regensburg, 1830–38); *Chroniken der deutschen Städte*, vol. xv (Leipzig, 1878); Küsser, *Alt- und Jung-Regensburg* (Regensburg, 1895); Walderdorff, *Regensburg in seiner Vergangenheit und Gegenwart* (ib., 1896); Fink, *Regensburg in seiner Vorzeit und Gegenwart* (ib., 1900).

REGENT BIRD. See BOWER BIRD.

REGENT DIAMOND. See PITT DIAMOND.

REGENT'S PARK. One of the largest London parks, covering 472 acres and containing zoölogical and botanical gardens. It was laid out in the time of George III on the site of the earlier Marylebone Park, once filled with game, subsequently cleared for a pasture, again replanted, and named for the Prince Regent (George IV).

REGENT STREET. A noted London street, a mile in length, laid out in 1813 to connect Carlton House, the Prince Regent's residence, with Regent's Park. It contains the finest shops of the city.

REGER, rå′gẽr, MAX (1873–1916). A German composer. He was born at Brand in Bavaria, March 19, 1873. His father and the organist Lindner were his first teachers. In 1890 he went to Riemann (q.v.) in Sondershausen, and when in the following year Riemann became professor at the conservatory in Wiesbaden, Reger followed him. Until 1895 he continued his studies with that eminent scholar, holding at the same time an appointment as teacher of piano at the conservatory. Having completed his year of military service (1896–97), he returned to his home in Weiden, whither his parents had removed in 1874. In 1901 he settled in Munich, where in 1905–06 he taught counterpoint at the Royal Academy. The following year he was called to Leipzig as music director at the university, teacher of composition at the conservatory, and conductor of the St. Paul's Verein. At the end of the first year he resigned his position at the university, but was made professor, and at the same time the University of Jena conferred upon him the degree of Ph.D. In 1911 the Duke of Meiningen appointed him court conductor of the famous Meiningen Orchestra. (See BÜLOW, HANS VON.) Among contemporaneous composers Reger occupies a unique position, in many respects similar to that of Brahms in the nineteenth century. Both cultivate the classical and polyphonic forms, the music of both is austere, both are rather aloof from the public of their time; the stage evidently allures Reger as little as it did Brahms. But in one respect they are utterly unlike. Brahms frequently produces his most grandiose effects by the very simplest means; Reger seems to be incapable of writing anything simple. Riemann states that Reger's earliest (unpublished) compositions bristled with contrapuntal complexities that seriously hampered his naturally strong inventive power. Even in his mature work the composer did not succeed in curbing this tendency. On the contrary he added such harmonic intricacies as to render the technical analysis of a Reger composition a severe problem and the actual hearing of these very long works rather a strain than a pleasure. And yet it would seem that in the future the musical creed of what at present constitutes only a small circle may be accepted as substantially true. Those who have succeeded in deriving enjoyment from this new master's works summarize the development of pure instrumental music as follows: Bach, Beethoven, Brahms, Reger. One thing, however, is certain even now: as a composer for the organ Reger surpasses all except the mighty Bach. Also a very rapid and prolific writer, he reached his op. 100 at the age of 34. The more important of his compositions for the organ are: *Fantasie und Fuge*, C minor, op. 29; *Fantasie and Fuge über B–A–C–H*, op. 46; *Symphonische Fantasie und Fuge*, op. 57; *Variationen und Fuge über ein Originalthema*, op. 73; *Introduktion, Passacaglia, und Fuge*, op. 127; two sonatas in F sharp minor, op. 33, and D minor, op. 60. For orchestra his principal works are: *Sinfonietta*, op. 90; *Serenade*, op. 95; *Variationen und Fuge über ein Thema von J. A. Hiller*, op. 100; *Symphonischer Prolog zu einer Tragödie*, op. 108; *Ouverture zu einem Lustspiel*, op. 120; *Romantische Suite*, op. 125; *Vier Tonbilder nach Böcklin*, op. 128; *Ballet Suite*, op. 130; *Violinkonzert*, op. 101; *Klavierkonzert*, op. 114. Reger wrote also several choral works with orchestra, a great deal of chamber music, piano works (two and four hands), and over 300 songs. Besides he transcribed for piano numerous songs and orchestral works by other composers. Especially noteworthy among these transcriptions are his very effective but extremely difficult arrangements of a number of Bach's organ works. His own harmonic innovations he defended and explained in an able book, *Beiträge zur Modulationslehre* (1903). Consult R. Braungart, *Max Reger*, in "Monographien moderner Musiker" (Leipzig, 1907), and M. Hehemann, *Max Reger: eine Studie über moderne Musik* (Munich, 1911).

REGGIO, rĕd′jō̇, DUKE OF. See OUDINOT, C. N.

REGGIO DI CALABRIA, rĕd′jō̇ dē̇ kȧ-lä′brē̇-ȧ. The capital of the Province of Reggio di Calabria, Italy, situated on the Strait of Messina, 8 miles southeast of Messina in Sicily (Map: Italy, E 5). The climate is salubrious and the scenery beautiful. Behind the city rises Aspromonte, where Garibaldi was taken prisoner in 1862. The city has a modern cathedral, an old castle, a statue of Garibaldi, a museum of antiquities, a public library, a lyceum, a technical school, and a seminary. There are manufactures of linens, silks, perfumes, olive oil, etc. The trade is chiefly in wine, fruit, grain, and fish. Pop. (commune), 1901, 44,415; 1911, 43,162; 1914 (est.), 42,996.

Reggio is the ancient Regium, founded by fugitives from Messina about 723 B.C. In 387 B.C. it was destroyed by Dionysius of Syracuse, but became a prosperous city again under the Romans. During the Middle Ages it was plundered by Goths, Saracens, and Turks. It was almost totally destroyed by the great earthquake of 1783, and again in December, 1908, but has since been rebuilt on modern lines.

REGGIO NELL' EMILIA, nĕl′lȧ-mē′lyȧ. The capital of the Province of Reggio nell' Emilia, Italy, situated on a branch of the Po and on the Piacenza-Bologna and other railroads, 16 miles west-northwest of Modena (Map: Italy, C 2). It is surrounded by walls and has broad and regular streets. The fifteenth-century cathedral is embellished with statues and monuments. Some of the churches, notably Madonna della Ghiara, contain famous frescoes. The theatre is one of the finest in Italy. There are a museum with a natural-history collection and a library with 56,500 volumes and 1051 valuable manuscripts; also a lyceum, a technical institute, and a seminary. The city lies in a fertile district and trades in wine, rice, and flax. There are manufactures of cotton and silk stuffs, brooms, leather, and cement. Pop. (commune), 1901, 58,490; 1911, 70,419. Reggio, the ancient Regium Lepidi, was a flourishing city under the Romans. It was made the seat of a bishopric in 450. In the twelfth century it became a republic, but passed into the possession of the Este family in 1290. It was repeatedly wrested from them, but was permanently secured early in the sixteenth century, and afterward shared the fortunes of Modena. Reggio is the birthplace of Ariosto.

REGIA, rē′jĭ-ȧ (Lat., royal house). The official residence of the pontifex maximus at Rome, situated on the Sacred Way, in the Forum, in the space between the temple of Faustina and the temple of Vesta. In it were chapels to Mars and Ops (see SATURN), a hall for religious conventions, and the archives of the priesthood. On its walls were engraved the *Fasti Consulares* and the *Fasti Triumphales* (see FASTI), fragments of which were discovered in 1543, when the building was demolished and its material used in the construction of St. Peter's. Consult Christian Hülsen, *The Roman Forum: Its History and its Monuments*, English translation by J. B. Carter (2d ed., New York, 1909), and S. B. Platner, *The Topography and Monuments of Ancient Rome* (2d ed., Boston, 1911).

REGICIDES, rĕj′ĭ-sīdz (from Lat. *rex*, king + *-cida*, assassin, from *cædere*, to kill). A name given in English history to those persons directly responsible for the execution of Charles I, and especially to those members of the High Court of Justice, 67 in number, who on Jan. 27, 1649, voted for his execution. Fifty-eight of the 67, besides Ingoldsby, who was not present when sentence was pronounced, ultimately signed the death warrant. In 1660, preparatory to his return, Charles II issued the Declaration of Breda, whereby pardon was promised to all excepting such as Parliament might afterward except. The Convention Parliament later passed an act of indemnity, but with many exceptions. Nineteen regicides, who had surrendered voluntarily, were kept in prison, together with six others, till their death, as far as is known, though they were never tried. Ten were executed immediately and three others were caught in Holland, brought to England, and executed. Many lived in exile for the rest of their lives, Goffe, Whalley, and Dixwell (qq.v.) in the American Colonies. But even the dead were not spared, the bodies of some being exhumed, dragged to Tyburn, and there burnt, after having been exposed on the gallows. Consult Mark Noble, *The Lives of the English Regicides* (2 vols., London, 1798), and Emmanuel Régis, *Les régicides dans l'histoire et dans le présent: étude medico-psychologique* (Paris, 1890).

REGICIDES' CAVE, or JUDGES' CAVE. A cavern near the top of West Rock, a cliff at New Haven, Conn., of interest to visitors. It was the place of concealment of the regicides Goffe and Whalley in 1661.

REGIL′LUS, LAKE. Anciently a small lake of Latium, to the southeast of Rome, somewhere about the foot of the Tusculan hills, probably occupying an extinct volcanic crater at a place called Cornufelle, near the modern Frascati. Lake Regillus is celebrated in the semilegendary history of Rome as the scene (496 B.C.) of a great battle between the Romans under Aulus Postumius and the Latins, on behalf of the banished Tarquin, under O. Mamilius. Consult Macaulay, *Lays of Ancient Rome* (many eds., a good one being that of New York, 1909).

REG′IMENT (Lat. *regimentum*, government, from *regere*, to govern). A military organization consisting of from two to four battalions (according to the army organization of the various nations and the arm of the service). In the United States army the cavalry, field artillery, and infantry regiments are administrative units, commanded by colonels. The cavalry regiment consists of 12 troops organized as squadrons, each commanded by a major; total war strength, 51 officers, 1236 enlisted men, 1294 mounts. The field artillery regiment consists of 6 batteries organized as 2 battalions, each commanded by a major; total war strength, 42 officers, 1128 enlisted men, 1062 horses. The infantry regiment consists of 12 companies organized into 3 battalions, each commanded by a major; total war strength, 51 officers, 1836 enlisted men. The regiment is the administrative unit. The battalion, or squadron, in a regiment is not an administrative unit and has no separate records; it is purely a tactical unit conveniently organized for instruction or manœuvre and particularly for combat, either as an integral part of the regiment or when acting independently.

The regimental organization of the English army is somewhat different, usually two regular battalions, commanded by a lieutenant colonel, form the regular regiment. With these two regular battalions are associated two or more militia or territorial battalions. The different battalions have their own system of administration, often serving in different parts of the Empire. The Foot Guards have three battalions, with the exception of the Irish Guards, which have but one. The Royal Engineers is a regiment by name, although consisting of more than 10,000 men.

The continental European organization is similar to that of the United States, with, usually, a greater number of rifles per infantry battalion. For further details, see Army Organization; Battalion; Company; and *Armies* under the different countries.

REGIMENTAL COURT-MARTIAL. Under the provisions of the Act of March 2, 1913, the regimental court-martial and the garrison court-martial were both abolished and replaced by the special court-martial. See Courts, Military, *Special Courts-Martial.*

REGINA, rē-jī′nȧ. A city and the capital of Saskatchewan, Canada, situated on the Canadian Pacific, the Canadian Northern, and the Grand Trunk Pacific railroads, 357 miles by rail west of Winnipeg (Map: Saskatchewan, F 7). The city is well laid out, with broad well-paved streets and several fine parks. It possesses the provincial Parliament buildings and Supreme Court, two hospitals, a normal school, Regina College (Methodist), St. Chad's College, Presbyterian College, and is the western headquarters of the Royal Northwest Mounted Police. The industrial establishments include flour mills, foundries and machine shops, elevators, wire and steel works, breweries, abattoirs, tanneries, and manufactories of sashes and doors, pressed bricks, grain cleaners, aërated waters, cigars, tractors, cement blocks, soap, farm implements, automobiles, mattresses, threshers, and carriages. There is a government creamery. Regina is the centre of a great wheat-producing area and the chief distributing point for the Canadian Middle West, especially for farm implements and machines. Pop., 1901, 2249; 1911, 30,213; 1915 (local est.), 47,500.

RE′GIOMONTA′NUS (1436–76). A German mathematician and astronomer, whose real name was Johannes Müller. He was born near Königsberg (whence his Latin name), was educated at Vienna, and was a pupil of George Purbach (q.v.). He collected numerous Greek manuscripts and translated many of them, especially the works of Ptolemy, Apollonius, Archimedes, and Hero of Alexandria. He also brought the algebra of Diophantus to the notice of Europeans. Regiomontanus was the author of a treatise on plane and spherical trigonometry, *De Triangulis Omnimodis* (1533), which contained the sine and cosine. Adopting the half chord of the Arabs, he constructed tables of sines and tangents. His work on arithmetic and algebra, entitled *Algerithmus Demonstratus* (1534), was among the first containing symbolic algebra. He established an observatory and printing press in Nuremberg and produced tables of eclipses and works on astronomy and astrology. He was called to Rome by Sixtus IV to revise the calendar, but died there the following year and was buried in the Pantheon. His works include: *De Quadratura Circuli* (1463); *De Doctrina Triangulorum* (1463); *Calendarium Novum* (1473); *Ephemerides ab Anno 1475–1506* (1474); *Disputationes Dialogus contra Gerhardi Cremonensis in Planetarum Theorias Deliramenta* (1475); *De Reformatione Calendarii* (1484); *De Cometæ Magnitudine Longitudineque* (1531); *Tabulæ Directionum Profectionumque* (1575). A collection of his letters was edited by Murr (Nuremberg, 1786). Consult Alexander Ziegler, *Regiomontanus: ein geistiger Vorläufer des Columbus* (Dresden, 1874).

REG′ISTER (ML. *register, registra, registrum,* variants of *regestum,* register, books of record, from Lat. *regestus,* p.p. of *regerere,* to record, from *re-,* back again, anew + *gerere,* to carry). In music, the compass of a voice or instrument; specifically a series of tones produced by the same mechanism and having the same quality. Generally considered, there are three registers in the female voice and two in the male voice. Those notes which proceed naturally and freely from the voice constitute the so-called chest register. The head register embraces those notes which are produced by a somewhat strained contraction of the glottis, while the falsetto register is that midway between the two. In speaking of the organ the term is equivalent to "stop." See Alto; Barytone; Bass; Mezzo; Phonetics; Singing; Soprano; Tenor; Voice.

REGISTER, Cash. See Calculating Machines.

REGISTRATION OF CHATTEL MORTGAGES. The statutes of many of the United States provide for the registration of chattel mortgages in addition to filing the instruments. This system is designed solely to give notice to the public, and does not combine the guaranty of validity secured by registration of titles to land in some States. The names of the parties, the amount secured, and date of execution, are usually the only facts registered, and therefore it practically amounts only to an index of the mortgages on file. See Title, Registration of.

REGISTRATION OF TITLE. See Title, Registration of.

REGISTRY OF MAIL MATTER. See Post Office.

REGISTRY OF VESSELS. Merchant vessels of the United States which are engaged in the foreign trade are registered in the office of the collector of customs of their home port. A registry certificate is issued assigning to the vessel her official number, signal letters, date of construction, home port (residence of managing owner), name of managing or principal owner, and her dimensions and tonnage in accordance with the information furnished by the surveying officer. Vessels engaged in the coasting trade or upon inland waters are enrolled and obtain a certificate of enrollment instead of registry. Vessels under construction are built in conformity with the rules of one of the marine registry societies and under the supervision of one of the society's surveyors. This is done in order to insure a suitable classification for marine insurance. See Load-Line Marks of Vessels; *Ship, Classification for Marine Insuranee* under the head of Ship and Shipping.

RE′GIUM. See Reggio di Calabria.

REGIUM LEP′IDI. See Reggio nell' Emilia.

RE′GIUS. See Rhegius.

REGIUS PROFESSOR (Lat., royal professor). The name given to the professors the patronage of whose chairs is vested in the crown. In the English universities the term is especially applied to those professorships founded by Henry VIII. See University.

REGLA, rā′glȧ. A suburb of the city of Havana, Cuba, situated on the east shore of Havana harbor (Map: Cuba, C 3). It is connected with the city by ferry and with Guanabacoa, 3 miles to the east, by a street railroad. It is also the terminus of a railroad to Matanzas, has sugar warehouses, foundries, and shipyards, and receives a considerable part of the shipping of the harbor.

REGNARD, re-nyär′, Jean François (1655–1709). A French dramatist, born in Paris, Feb. 7, 1655. In 1678 he was captured by corsairs on his way from Italy to France and held as a slave at Algiers. This event occasioned his novel *La Provençale.* Later he traveled very widely, from Scandinavia to Turkey, returning finally to France (1683), dividing the time between Paris and his estate at Grillon. He died Sept. 4, 1709. Regnard wrote several prose dramas (1688–93); then short plays in verse, and in 1696 produced his first great comedy, *Le joueur,* which with those that followed, *Le distrait* (1697), *Démocrite* (1700), *Les folies amoureuses* (1704), *Les Ménechmes* (1705), and *Le légataire universel* (1708), made him second only to Molière in contemporary esteem. He continued also to write dramas in prose, of which *La foire de Saint-Germain* is most noteworthy, and in *La suite de la foire* he combined prose and verse. He sought to combine the qualities of La Bruyère and Molière, but for this he lacked depth, strength, and seriousness. He shows to best advantage in plot, action, and dialogue, not in analysis and portrayal of character. Regnard's works were collected in five volumes in 1731 and in two volumes in 1854. Everything of primary importance is in the *Collection Didot* (Paris, 1820). The latest edition is by Moland (ib., 1875). Consult Marcel Compaignon de Marchéville, *Bibliographie et iconographie des œuvres de Jean François Regnard* (Paris, 1877), and R. Marenholtz, *Jean François Regnard: eine Lebenskizze* (Oppeln, 1887).

REGNAULT, re-nyō′, Henri (1843–71). A French figure and genre painter. He was born in Paris, Oct. 30, 1843. After a brilliant record in classical studies he entered the atelier of Lamothe and afterward that of Cabanel, won the Prix de Rome in 1866, and during the two years spent at Rome he designed, among other illustrations, those for Wey's *Rome.* Among his paintings executed at the same time were "The Lady in Red" and "Automedon Taming the Horses of Achilles" (Boston Museum of Fine Arts). In 1868 he went to Spain, and while at Madrid he devoted himself especially to the study of Velazquez, whose influence appears in his equestrian portrait of General Prim, one of the finest of the century. Refused by the sitter, it was taken by the artist to Paris, where it created a great sensation in the Salon of 1869, and is now hung in the Louvre. From the same year dates his charming portrait of the Countess de Barck (Louvre) and "Judith" (Marseilles Museum), and in 1870 he exhibited "Salome," a symphony in yellow, an incarnation of sensual cruelty. In that year he went to Morocco, whence he sent his famous symphony in red, the "Moorish Headman" (Louvre), a type of the dreamy cruelty of Oriental fatalism. But hearing of the disastrous opening of the Franco-German War, he hastened back to Paris and, enlisting in a regiment, was killed at the sortie of Buzenval, Jan. 19, 1871. In the following year the pupils of the Ecole des Beaux-Arts erected a monument to him in the chief court of that school. Regnault was the greatest of the followers of Delacroix (q.v.), whose worthy heir he was, both as regards temperament and technique. He resembled him in brushwork and in color, and his drawing is even surer. Consult: Henri Baillière, *Henri Regnault* (Paris, 1872); Henri Cazalis, *Henri Regnault: sa vie et son œuvre* (ib., 1872); Roger Marx, "Henri Regnault," in *Les artistes célèbres* (ib., 1886); Regnault's *Correspondance,* edited by Duparc (Paris, 1904).

REGNAULT, Henri Victor (1810–78). A French chemist and physicist, born July 21, 1810, at Aix-la-Chapelle, Germany. As a boy he went to Paris and found employment in a drapery establishment. In this manner he was able to provide for himself and his sister while devoting his leisure hours to study. In 1830 he was admitted to the Ecole Polytechnique, and two years later, on completing his course of study, entered on the practice of mining engineering. After filling for some time the chair of chemistry at Lyons, he was elected a member of the Academy of Sciences, and in 1840 he became professor of chemistry at the Ecole Polytechnique. In the following year he succeeded Dulong as professor of physics at the Collège de France. In 1847 he was made chief engineer of mines and in 1854 director of the porcelain manufactory at Sèvres. He died at Auteuil, Jan. 19, 1878.

Regnault devoted himself especially to the careful measurement of the constants of nature, laying the foundation on which important chapters in theoretical and physical chemistry have since been built by other investigators. His greatest work is that on the numerical data bearing on the working of steam engines, for which the Royal Society of London awarded him their Rumford medal. This work forms volume xxi of the *Mémoires* of the Academy of Sciences. He measured with great care the specific heats of various substances, and his determinations showed that the specific heat of solid chemical compounds is very nearly equal to the sum of the products of the specific heats and the numbers of atoms of the ingredient elements. He similarly showed that the specific heat of a solid alloy can be calculated directly from the specific heats of the component metals. He determined precisely the values of the vapor pressure of water corresponding to various temperatures and measured the vapor pressures of mixtures such as those of sulphuric acid and water. He determined the densities of the so-called permanent gases and investigated the true relations between the pressure and volume of gases. Regnault showed that the law of Boyle and Mariotte is only approximately correct. Regnault's data have led to important developments in the kinetic theory of gases and to more correct views concerning the relations between the gaseous and liquid states of aggregation. Among his contributions to organic chemistry the discovery of a number of interesting compounds, including carbon tetrachloride and derivatives of the unsaturated hydrocarbons, deserves mention. He published his observations in the *Annales de Chimie et de Physique* and the *Comptes Rendus* of the Academy of Sciences. He also wrote *Cours élémentaire de chimie* (1849–50 and several later editions) and an abridgment of this work, entitled *Premiers éléments de chimie* (1850; 6th ed., 1874). A collection in three volumes of most of his papers on gases and vapors appeared under the title *Relation des expériences entreprises pour déterminer les lois et les données physiques nécessaires au calcul des machines à feu* (1847–70). Consult Dumas, *Eloge historique de Henri Victor Regnault* (Paris, 1881).

REGNAULT, Jean Baptiste, Baron (1754–1829). A French historical painter, of the classical school. He was born in Paris and studied under Bardin, or, according to other authorities, under Vieu; took the Prix de Rome in 1776; and was elected to the Academy in 1783 and to the Institute in 1795. His works are in the cold correct style of the period, but are happy in arrangement and occasionally, as in his masterpiece, the "Education of Achilles," show considerable spirit. Among his other canvases are the "Baptism of Christ," in the Louvre, and historical paintings at Versailles. As a teacher Regnault was the chief rival of David.

REGNIER, re-nyȧ′, CLAUDE AMBROISE, DUKE DE MASSA (1736–1814). A French statesman, born at Blamont, Meurthe-et-Moselle. An advocate by profession, he was a deputy to the States-General (1789) and took a prominent part in establishing the Republican judiciary, but retired during the Reign of Terror. In 1795 he was elected to the Council of the Ancients. He became president of that body in 1798, shared in the coup d'état of the following year, and, as Councilor of State under Bonaparte, was intrusted with the revision of the civil code. He was Minister of Police in 1802–04 and Minister of Justice from 1802 to 1813, when he was made President of the Legislative Assembly. He was created Duke in 1809.

RÉGNIER, rȧ′nyȧ′, HENRI DE (1864–). A French author, born Dec. 28, 1864, in Honfleur (Calvados) and educated in Paris. The series of sonnets, entitled *Sites* (1887), which first brought the poet to public notice, were essentially classic and correct. A new manner, new metres, and the sparing use of the *vers libre* in the volumes which immediately followed marked him as a leader among the Symbolists and a pupil of Mallarmé and Verlaine. In this period mention should be made of *Episodes* (1888), less personal or analytical than any preceding volume and but little more than a series of voluptuously beautiful pictures; of *Poèmes anciens et romanesques* (1890), in which symbolic meaning is given to many old stories; of *Tel qu'en songe* (1892), with its mystic and reflective fancy of double personality; and of *Aréthuse* (1895), his most finished work, an admixture of Hellenic myth and beauty with Celtic melancholy. *La corbeille des heures* reverts to the theme of the earlier poems with an added beauty of treatment, and in *Médailles d'argile* (1900) the poet returns to his earlier exactness of metre. In his fiction —*La canne de jaspe* (1895), *Le trèfle blanc* (1899), *La double maîtresse* (1900), *Les vacances d'un jeune homme sage* (1903), *Rencontres de Monsieur de Bréat* (1904), *Le passé vivant* (1905), *La peur de l'amour* (1907), *Le mariage de minuit* (1910), *La eanne de jaspe* (1912), and *L'Amphisbène* (1912)—Régnier shows the same fondness for the unreal and the mediæval, and the same command of melodious diction as in his verse. To an unusual degree Régnier's work embodies the spirit and style of the libertine story-tellers of the eighteenth century. In 1896 he married Marie, second daughter of Jose-Maria de Heredia (q.v.). He lectured before college audiences in the United States in 1900, in 1910 was made an officer of the Legion of Honor, and in 1911 was elected to the French Academy. Consult Amy Lowell, *Six French Poets* (New York, 1915).

RÉGNIER, MATHURIN (1573–1613). A French satirist, the nephew of Philippe Desportes (q.v.). He was born at Chartres, took orders as a youth, and went in 1593 as secretary with the Cardinal de Joyeuse to Rome. He returned in 1604, and in 1609 was made a canon in the Chartres Cathedral. He died in the prime of his talent, as the result of his excesses. His 16 satires include: *Le goût décide de tout; L'honneur l'ennemi de la vie; L'Amour qu'on ne peut dompter; Régnier apologiste de lui-même: La folie est générale; Le mauvais lieu.* The ninth attacks Malherbe. Dowden says: "His satires are those of a painter whose eye is on his object and who handles his brush with a vigorous discretion; they are criticisms of society and its types of folly or of vice, full of force and color, yet general in their intention, for except at the poet who had affronted his uncle, le bon Régnier struck at no individual." The only work printed during the poet's lifetime was *Satires et autres poésies de Mathurin Régnier* (1608, 1613). The best editions of his work are those of Viollet-le-Duc (1853), Barthélemy (1862), and Courbet (1869, 1875). Consult Vianey, *Mathurin Régnier* (Paris, 1896).

REGRAT′ING. An old common-law offense, consisting of buying "corn and other victuals" and scheming to enhance the price artificially. The offense was early made a matter of statute in England, and probably is not recognized as a common-law offense in the United States. The ancient crimes known as forestalling (q.v.) and engrossing (q.v.) were quite similar in nature.

REG′ULA (Lat., rule). A band under a triglyph (q.v.) in the Doric style. It has the shape of a narrow stripe of marble, and on the lower side has six guttæ (q.v.). It seems to represent an original wooden cleat secured by nails.

REGULA FAL′SI (Lat., rule of the false). The Latin name for the method of false position (q.v.). This method was largely used in the Middle Ages in the solution of equations. For example, the simple equation $ax + b = 0$ was solved thus: if z_1 and z_2 are any two numbers and $az_1 + b = c_1$, $az_2 + b = c_2$, then $x = \frac{z_2c_1 - z_1c_2}{c_1 - c_2}$. The truth of the rule is easily seen, for the eliminant of the equations

$$\begin{aligned} ax + b + 0 &= 0, \\ az_1 + b - c_1 &= 0, \\ az_2 + b - c_2 &= 0, \end{aligned}$$

with respect to a and b, is

$$\begin{vmatrix} x & 1 & 0 \\ z_1 & 1 & -c_1 \\ z_2 & 1 & -c_2 \end{vmatrix} = 0,$$

which reduces at once to the form stated. Consult Matthiessen, *Grundzüge der antiken und modernen Algebra* (2d ed., Leipzig, 1896).

REGULAR ARMY AND NAVY UNION OF THE UNITED STATES OF AMERICA. A patriotic society founded in Washington, D. C., Nov. 4, 1897. It has for its principal objects to provide for comrades when sick or in need; to assist in the burial of its dead; to keep alive old friendships formed in the service; to suggest and encourage the enactment of necessary laws for the benefit of soldiers, sailors, or marines; and to keep before the people and the officials of the government the necessity and justice of giving employment in the government service to men honorably discharged or retired who have rendered faithful military service to the government and who are trustworthy and competent. It admits to membership members of the regular army, navy, or marine corps of the United States, or those who have been honorably discharged or retired, if they have served five years in either branch of the service. Its insignia consists of a badge pendant from a ribbon, which is the national flag, with a clasp at the top formed of a spread eagle, while the badge itself consists of a cross with the emblems of the different branches of the service in the points, and in the centre a triangle, with the letters A, N, and M, signifying Army, Navy, and Marine, surrounded by the legend "Trinitas Protego, R. A. and N. U., U. S." It has a membership of upward of 10,000, divided among garrisons and subgarrisons in the United States and the Philippines.

REGULARITY, in Botany. See Irregularity.

REGULATED COMPANIES. Associations of merchants formed in early modern times to exploit monopolies of special branches of foreign trade. Each member of the company embarked his capital in the monopolized trade, managing his own business, but subject to the regulations of the company. These companies were formed on the model of the mediæval guild (q.v.). They made rules for admission to the company, decided how great a volume of business each member should transact, and sometimes fixed prices. The company as a body possessed property, as, e.g., factories, i.e., trading posts, in the country with which they traded; but there was no idea of making profits to be distributed to the company as a whole. Through their regulation active competition among members was obviated and coöperation against foreign competitors assured. Thus it became possible to carry on trade which an isolated trader would not have ventured upon.

The earliest regulated companies were those formed by the merchants of the Hanseatic League (q.v.) for trading in England. The plan was adopted by the English merchants who first engaged in foreign trade, the Merchants of the Staple and the Merchants Adventurers (q.v.). The regulated company was the form of organization of the Levant Company, incorporated in 1581 to carry on trade in the eastern Mediterranean; the Muscovy Company (1554), of merchants trading in Russia; the Eastland Company, incorporated under Elizabeth to carry on trade with the Baltic countries. The East India Company, as originally constituted, formed a transition from the regulated to the joint-stock company. In the last-named company individual members were not given a right to carry on trade on private account, but were required to trade through subcompanies under the control of the parent company.

This form of organization was in its time distinctly superior to unregulated private trading, but it proved inadequate for carrying on so hazardous and extensive a trade as that with the East Indies and was gradually supplanted by the joint-stock company. After 1612 the East India Company had abandoned the principle of the regulated company. The other companies mentioned continued to exist in their original form until the eighteenth century. In the seventeenth century they showed a tendency towards monopoly, excluding, through excessive entrance fees, traders who desired to gain membership. Hence arose a class of interlopers, who traded in the monopolized region in defiance of the company. The minute regulations imposed upon members proved to be vexatious in the more enterprising trade of the seventeenth century, and were in large measure responsible for the decline of the companies.

REGULATION. See Biology.

REGULATORS, The. The name given to those who actively opposed excessive taxes, dishonest sheriffs, and extortionate fees, in what were then called the back counties of North Carolina, in 1767–71. Practically all authority was at this time centred in the royal Governor; the taxes were levied exclusively upon the poll; there was little money in the western counties and no market for the products of these counties. The court officials, moreover, were accused of exacting illegal fees. Disturbances in Mecklenburg and Granville counties in 1765 and in Orange County in 1766 were easily put down. The Regulation proper began in Orange County in the spring of 1768, the Regulators agreeing to pay no more taxes until they were satisfied that such taxes were according to law and to pay no more than the legal fees. The news that the Assembly had appropriated £15,000 to build a house for the Governor increased the dissatisfaction. Minor disturbances occurred in the county, and the county militia was ordered out. William Butler and two other Regulators were fined and imprisoned. Edward Fanning, register of the county, was found guilty of extortion in office on five counts and was fined a penny and costs on each. The Assembly in 1769 was in sympathy with the Regulators. Petitions from Anson, Rowan, and Orange counties demanded among other things salaries for officers instead of fees, a property tax, and that ministers of any denomination should be allowed to perform the marriage ceremony. This Assembly was dissolved by the Governor, November 6, after a session of two weeks. In September, 1770, renewed disturbances occurred in Orange County. The Assembly thereupon expelled Herman Husband, one of the leaders of the Regulators, passed a Riot Act, voted £500 for the defense of the town, but proceeded to pass much legislation demanded by Regulators. In May, 1771, Governor Tryon (q.v.), at the head of a large force, proceeded to Hillsboro. On May 16 he met about 2000 Regulators, of whom hardly half were armed, at Alamance Creek. A sharp contest ensued for two hours. Of the Loyalists 70 were killed and wounded, while 9 of the Regulators were killed, a "great number" wounded, and 15 taken prisoners, one of whom was hanged on the spot. Six of the prisoners were tried and executed. By July 4 more than 6000 men had taken the oath of allegiance, and the Regulator leaders were pardoned by the King before the Revolution. In 1772 it was estimated that 1500 had emigrated to the West, and the excitement was over. During the Revolution most of the Regulators adhered to the King. Consult Bassett, "The Regulators of North Carolina," in the *Report* of the American Historical Association for 1894 (Washington, 1895), and W. H. Hoyt, *The Mecklenburg Declaration of Independence* (New York, 1907).

REG'ULUS, Marcus Atilius. A Roman general. He was consul for the first time in 267 b.c., and for his successes against the Sallentini obtained the honor of a triumph. Chosen consul a second time (256 B.C.), he was sent along with his colleague, L. Manlius Vulso, at the head of a fleet of 330 ships (with a land army on board) against the Carthaginians, in the ninth year of the First Punic War, and, encountering the enemy's fleet off Heraclea Minor, totally defeated it. The Romans then landed near Clypea, where they established their headquarters and ravaged the surrounding Carthaginian territory with fire and sword. When Manlius was recalled to Rome with one-half of the land forces, Regulus was left to carry on the war with the remainder. For some time he was victorious in every encounter, but at last (255 B.C.) suffered a total defeat; 30,000 Romans were left dead on the field, about 2000 fled and took shelter in Clypea, and Regulus, with 500 more, was taken prisoner. Regulus remained in captivity for five years, but, when fresh reverses induced the Carthaginians to solicit peace, he was released on parole and sent to Rome in company with the Punic envoys. The rest of his history is a favorite Roman tale. According to this, Regulus at first refused to enter Rome, since he was no longer a citizen; after this conscientious scruple was overcome he declined to give his opinion in the Senate until he was commanded to do so; he then sought earnestly to dissuade the Senators from agreeing to any of the Carthaginian proposals, even to an exchange of prisoners, and, after he had succeeded, by his earnest appeals, in obtaining the rejection of the Carthaginian offers, he resisted all persuasions to break his parole, though conscious of the fate that awaited him, and, refusing even to see his family, returned with the ambassadors to Carthage, where the rulers put him to death with horrible tortures. The common story is that he was placed in a cask or chest stuck full of nails with the points projecting inward and rolled about till he expired; when the news of this event reached Rome, retaliations equally atrocious, it is said, were committed on two of the noblest Carthaginian prisoners. (See Cicero, *De Officiis*, iii, 26; Livy, *Epitome of Book XVIII;* Silius Italicus, *Punica*, vi, 299–550.) Since, however, this story is not mentioned by Polybius (c.200 B.C.), who details at great length the achievements of Regulus (i, 25–34), modern authorities incline to doubt it. Consult the article "Atilius, 6," in Friedrich Lübker, *Reallexikon der klassischen Altertums*, vol. ii (8th ed., Leipzig, 1914).

REHAN, rē′ån (originally CREHAN), ADA (1860–1916). An American actress. She was born in Limerick, Ireland, April 22, 1860, and was brought to the United States when about six years old. While still at school she appeared upon the stage, but she virtually began her career by a two years' engagement at Mrs. Drew's theatre, in Philadelphia, during 1873–75. Subsequently she was with John W. Albaugh's company, playing leading juvenile parts, often with well-known stars, in Baltimore, Albany, and elsewhere. When Augustin Daly opened his theatre in New York in 1879, she joined his company, with which she continued till his death. As leading woman in the company, and after 1894 as a recognized star, she played the heroines in a long series of successful comedies, for which Daly's management was noted. Both in the delicate art of high comedy and in more farcical characters she won for herself before 1890 a place in the front rank of American players. Her two greatest rôles were those of Rosalind in *As You Like It* and Katharine in *The Taming of the Shrew*, while her Viola and her Lady Teazle were also much admired. Among her parts in Mr. Daly's lighter productions were those of Valentine Osprey in *The Railroad of Love*, Peggy in *The Country Girl*, Kate Verity in *The Squire*, Nancy Brasher in *Nancy and Company.* She was Maid Marian in Tennyson's *Foresters* and Roxane in Daly's presentation of *Cyrano de Bergerac.* Miss Rehan had great success in Germany in 1886, as also in Paris; and in London in 1888 and on frequent subsequent visits her popularity became almost as great as in America. She retired from the stage in 1906 and made New York her residence. Consult: William Winter, *Ada Rehan: A Study* (limited ed., New York, 1891); id., *Shadows of the Stage* (ib., 1892); L. C. Strang, *Famous Actresses of the Day in America* (Boston, 1899); Norman Hapgood, *The Stage in America, 1897–1900* (New York, 1901); William Winter, *The Wallet of Time*, vol. ii (ib., 1913).

REHATSEK, rå′hȧt-shĕk, EDUARD (1819–91). An Orientalist, born at Illach in Slavonia and educated in Budapest. He left for the United States in 1842, where he lived for four years, mostly in New Orleans. In 1847 he settled in Bombay, where he became professor of Latin and mathematics in Wilson College. About 1871 he became examiner in Latin, Arabic, and Persian to Bombay University, but in 1881 he resigned this post and spent the last decade of his life as a Hindu pundit. He contributed to the *Calcutta Review*, *Indian Antiquary*, *Journal of the Royal Asiatic Society* (Bombay Branch), and *Zeitschrift der deutschen morgenländischen Gesellschaft.* His published works include a valuable catalogue of the Arabic, Persian, Turkish, and Hindustani manuscripts in the Mulla Firuz (1873); *Amusing Stories* (1870), *Fortune and Misfortune* (1871), both from the Persian; a study on the Persian and Arabic inscriptions in Guzerat in the *Archæological Survey of India* (1885); a version of Mirchond's *Universal History* (1893); and a translation of Mīr Khwānd's *Garden of Purity* (1891–94).

REHEARSAL, THE. A burlesque by George Villiers, Duke of Buckingham, produced in 1671, ridiculing D'Avenant, Dryden, Sir Robert Howard, and other writers of the heroic dramas of the Restoration.

REHN, rān, FRANK KNOX MORTON (1848–1914). An American marine painter. He was born in Philadelphia and studied at the Pennsylvania Academy. Although he also painted landscapes and portraits, he is best known for his marines, which possess solid technical qualities and delicacy of tone. Good examples are "The Close of a Summer Day," Buffalo Academy; "The Missing Vessel," Detroit Museum; "A Moonlight Sea—Cape Ann" (1912); "The Swirl of the Surf" (1913); "A Sunny Afternoon in the Gulf Stream" (1914). He was made a member of the National Academy of Design in 1908 and received gold medals at the competitive Prize Fund Exhibition (1885) and at the American Art Society, Philadelphia (1907).

RE′HOBO′AM (Gk. Ῥοβοάμ, *Rhoboam*, Heb. *Rĕḥab'ām*, probably the (divine) kinsman is, or makes, wide). The son of King Solomon by his wife, Naamah, Princess of the royal house of

Ammon, and his successor, in early youth, to the throne of all Israel (c.953–937 B.C.). The hereditary jealousy of Israel towards Judah, aggravated by Solomon's tyrannical exactions, came to a head at once upon the son's accession. He proceeded to Shechem to receive the homage of Israel, and arrogantly rejected the demand of his subjects that he lessen their burdens (1 Kings xi. 43, xii. 15). The leadership of the discontented tribes by Jeroboam, who already in Solomon's reign had been exiled for conspiracy (1 Kings xi. 26–40) and who had returned upon the death of Solomon, indicates a well-defined plan of revolt. The temper of Israel is further shown by the murder of Adoram, the aged minister of public works. Rehoboam, taken unawares, had to flee to Jerusalem; he made a show of compulsion by force of arms, but Judah had no forces commensurate with those of the north, and hostilities were confined to border warfare; according to the narrative he was forbidden to prosecute the war by the prophet Shemaiah (1 Kings xii. 16–24). From this time the so-called Kingdom of Judah consisted only of the tribe of Judah and half of Benjamin, with remains of Dan and Simeon. During the reign of Rehoboam Palestine was invaded (c.949 B.C.) by Shishak, or Sheshonk, the founder of the twenty-second Egyptian dynasty. The narrative relates his spoliation of Jerusalem, where the temple suffered heavily (1 Kings xiv. 25–28). (See SHISHAK.) Rehoboam reaped the fruits of his father's vainglorious policy, and personally doubtless deserves the biblical condemnation (1 Kings xiv. 21–24), while his wife, probably a descendant of Absalom, exerted a powerful and evil influence in the government. He was succeeded by his son Abijam (Abijah). See JEROBOAM I.

REHO'BOTH (Heb. pl. of *rĕchōb*, wide, particularly the plaza by a city gate, the market and forum of an Oriental town, hence a common place name). 1. The name of a well dug by Isaac (Gen. xxvi. 22). As it is associated with Beer-sheba, the identification with the name of Wadi el Ruheibe, 8 miles southwest of Beersheba, is plausible. Here Robinson discovered ruins of a large city. This city evidently belongs to the Byzantine period. Two inscriptions found here were published by the Dominicans in *Revue Biblique* (Paris, 1905). Twenty-one inscriptions discovered at Ruheibe were published by Schmidt and Charles. Those that are dated come from the end of the sixth century A.D. The town possibly figures under the name of Rubuta in the Tell el Amarna letters (182, 183, 239). It was known to Josephus (*Ant.*, i, 18, 2) as Ροωβώθ, *Roōbōth*. In the Græco-Roman period its name seems to have been Robotha. It is mentioned in the *Notitia Dignitatum* and in the *Rescript of Beersheba*. Consult: Robinson, *Biblical Researches*, vol. i (Boston, 1841); Palmer, *Desert of the Exodus* (Cambridge, 1871). Schmidt and Charles, "Greek Inscriptions from the Negeb," in *American Journal of Archæology* (Boston, 1910). 2. Rehoboth by the river (properly river town), the home of an Edomite king (Gen. xxxvi. 37; 1 Chron. i. 48). As "the river" is par excellence the Euphrates, the place has been assigned to Mesopotamia; but it can only be located in Edom.

REICH, rīk, EMIL (1854–1910). A writer on political science, philosophy, and other subjects. He was born at Eperjes, Hungary, was educated at Prague, Budapest, and the University of Vienna, and traveled extensively, spending 5 years in the United States, 4 in France, and 13 in England, where he frequently lectured at Oxford, Cambridge, and London universities. His publications include: *Die bürgerliche Kunst und die besitzlosen Volksklassen* (2d ed., 1894); *Foundations of Modern Europe* (1904; 2d ed., 1908); *Success Among Nations* (1904); *Imperialism* (1905); *The Failure of the "Higher Criticism" of the Bible* (1905); *An Encyclopædia of Institutions, Persons, Events, etc., of Ancient History and Geography* (1906); *Plato as an Introduction to Modern Criticism of Life* (1906); *Success in Life* (1907); *Germany's Swelled Head* (1907; 2d ed., 1914; American ed. as *Germany's Madness*, 1914); *Woman through the Ages* (2 vols., 1908); *General History of Western Nations from 5000 B.C. to 1900 A.D.* (1908); *Handbook of Geography, Descriptive and Mathematical* (2 vols., 1908); *Nights with the Gods* (1909).

REICHA, rīk'à, ANTON (1770–1836). An Austrian musical theorist and composer, born at Prague. He was nephew and pupil of the musician Joseph Reicha. From 1794 to 1799 he was piano teacher in Hamburg, where he wrote an opera, *Obaldi, ou les Français en Egypte*, which he took to Paris for production. He was unsuccessful with this, but two symphonies obtained for him a reception as instrumental composer. He lived in Vienna from 1801 to 1808, where he became intimate with Beethoven and was on friendly terms with Haydn, Albrechtsberger, and Salieri. In 1808 he returned to Paris and brought out the operas *Cagliostro* (1810), *Natalie* (1816), and *Sapho* (1822). These were only fairly successful. His Italian opera, *Argina, regina di Granata*, had previously failed in Vienna. He gained, however, a high reputation as theorist teacher and instrumental composer. In 1818 he succeeded Méhul as professor of counterpoint and fugue at the Conservatory, was naturalized in 1829, and succeeded to Boieldieu's chair in the Académie in 1835. Among his works are many instrumental pieces, especially string quartets and quintets for wind instruments, and the treatises: *Etudes ou théories pour le pianoforte dirigées d'une manière nouvelle* (1800); *Traité de haute composition musicale* (1824–26); *L'Art du compositeur dramatique* (1833). He was not an inventor, but his theoretical works are of practical value even to-day.

REICHARDT, rīk'ärt, JOHANN FRIEDRICH (1752–1814). A German composer, conductor, and writer on music, born at Königsberg. He had good musical training and studied philosophy at Königsberg and Leipzig. In 1775, upon the death of Agricola, he obtained the position of kapellmeister at Berlin. During an extended leave of absence in London and Paris (1785–86) he brought out his Passion music (after Metastasio) in both cities. He was commissioned to write two operas, *Tamerlan* and *Panthée*, for the Grand Opéra; but the death of Frederick II made it necessary for him to return at once to Berlin and the operas were not produced. Under Frederick William II he was permitted to increase the orchestra and obtain new singers from Italy, but later was suspended for three years and finally dismissed in 1794 on account of his sympathy with the French Revolution. Upon the death of the King he returned to Berlin, but the French occupation in 1806 drove him back to Königsberg. Jerome Bonaparte, however, forced him to return and appointed him kapellmeister at Cassel. He composed numerous German and Italian operas, incidental music to plays, and *Singspiele* which had considerable influence on the development of German opera. As a song composer he is perhaps the most important before Schubert. He set about 60 of Goethe's lyrics to music. He published: *Ueber die deutsche komische Oper: Briefe eines aufmerksamen Reisenden, die Musik betreffend* (1774–76); *Studien für Tonkünstler und Musikfreunde* (1793); *Vertraute Briefe aus Paris* (1804–05); *Vertraute Briefe, geschrieben auf einer Reise nach Wien* (1810), all of which are of permanent value. Consult E. Lange, *Johann Friedrich Reichardt* (Halle, 1902), and W. Tauli, *J. F. Reichardt: sein Leben und seine Stellung in der Geschichte des deutschen Liedes* (Berlin, 1903).

REICHENAU, Hermann von. See Hermann von Reichenau.

REICHENBACH, rī′Ken-bäG. A town in Silesia, Prussia, 32 miles southwest of Breslau (Map: Germany, G 3). It has an old castle and a Realgymnasium. It manufactures cotton and woolen fabrics, wagons, and sausages. A convention was concluded here between Austria and Prussia in 1790 by which the two powers agreed to respect the integrity of Turkey and Poland respectively. Pop., 1910, 16,387.

REICHENBACH. A town in the Kingdom of Saxony, Germany, 56 miles by rail south of Leipzig (Map: Germany, E 3). It has a new town hall, a commercial school, and a Realschule. There are wool mills, dye works, and machine shops. Pop., 1900, 24,498; 1910, 29,685.

REICHENBACH, Georg von (1772–1826). A German mechanician and optician, born at Durlach in Baden. He attended the military school at Mannheim, traveled in England in 1791–93, was an officer in the Bavarian army, and after 1804 engaged in making various kinds of optical and astronomical instruments at Munich until 1821, when he was employed as an engineer by the Bavarian government. He was responsible for the general use of the transit circle in European observatories after 1819.

REICHENBACH, Karl, Baron von (1788–1869). A German naturalist and technologist, born at Stuttgart. He was educated at the University of Tübingen. He established ironworks at Villingen and kilns for the production of charcoal at Hausach. His researches in connection with the manufacture of charcoal led him to study the products of destructive distillation of organic bodies in general, and he was the first to obtain creosote and paraffin. In 1821, in connection with Count Hugo zu Salm, he founded the ironworks at Blansko in Moravia, and took charge personally of their superintendence. His name is also connected with what he thought to be the discovery of a new force of nature, an account of which may be found under Od. His principal publications include: *Geologische Mitteilungen aus Mähren* (1834); *Physikalisch-physiologische Untersuchungen über die Dynamide des Magnetismus, der Electricität, etc., in ihren Beziehungen zur Lebenskraft* (1849; trans. into English). Consult A. R. von Schrötter, *Karl Freiherr von Reichenbach: eine Lebensskizze* (Vienna, 1869).

REICHENBERG, rī′Ken-bĕrK. An important industrial town in the Crownland of Bohemia, Austria, situated on the Neisse, 52 miles northeast of Prague (Map: Austria, D 1). It is a well-built town with a number of interesting churches, including the Kreuzkirche, built at the end of the seventeenth century, a sixteenth-century palace belonging to the counts of Clam-Gallas, a new Rathaus, and a number of monuments. The educational institutions of the town comprise a technical school, a higher Gymnasium, a seminary for teachers, a textile school, a municipal theatre, an industrial museum, and the municipal gallery, containing the Liebig collection of modern German and French masters. The textile industry was introduced into the town as early as the beginning of the fifteenth century, and Reichenberg, together with a number of adjacent villages, produces now cloth, carpets, and various kinds of woolen and cotton goods on a very large scale. Reichenberg contains also the immense meat and malt extract works of Liebig & Co. Pop., 1900, 34,204; 1910, 36,350.

REICHENBERG, Suzanne Angélique Charlotte (1853–). A French actress, born in Paris. She was educated at the Conservatoire of Paris, and in 1868 made her début as Agnes in the *Ecole des Femmes* at the Comédie Française, of which she became a *sociétaire* in 1872. She retired from the stage in 1898, when she was married to Baron Pierre de Bourgoing. Her most popular rôles included Rosette in *On ne badine pas avec l'amour* and Marthe in *La souris.* She appeared also in *Monde ou l'on s'ennuie; Les ouvriers; Les Fourchambault; Les corbeaux; Denise; Francillon; Pépa; Les romanesques.*

REICHENHALL, rī′Ken-hȧl. A town and watering place in the Kingdom of Bavaria, Germany, picturesquely situated amid lofty mountains, on the Saalach, 8½ miles southwest of Salzburg (Map: Germany, E 5). It is the centre of the Bavarian salt works (the largest in Germany). The saline baths, famous since the eighth century, are the most important in the German Alps. Pop., 1900, 4972; 1910, 6204.

REICHENSPERGER, rī′Ken-spĕr′gẽr, August (1808–95). A German politician, born at Coblenz. He studied law at Bonn, Heidelberg, and Berlin, was a member of the federal Diet at Frankfort in 1848 and of the Erfurt Parliament in 1850, and became a counselor to the Cologne Court of Appeal in 1849. He served in the Prussian Second Chamber in 1850–63, in the Reichstag in 1867–84, and also in the Prussian Chamber of Deputies (Abgeordnetenhaus) after 1879. Of the Catholic group, which he had organized in 1852 and which became known as the Centre party, he was a leader for the rest of his life. His writings on art and architecture include: *Die christlich-germanische Baukunst* (1845; 3d ed., 1860); *Fingerzeige auf dem Gebiete der christlichen Kunst* (1854); *Vermischte Schriften über christlichen Kunst* (1856); *Georg Gottlob Ungewitter und sein Werken als Baumeister* (1866); *Augustus Pugin, der Neubegründer der christlichen Kunst in England* (1877).

REICHER, rīK′ẽr, Emanuel (1849–). A German actor, born at Bochnia, Galicia. His early reputation was gained at the Josefstadt Theatre in Vienna, at the Royal in Munich, and at the Stadt in Hamburg. In Berlin he played at the Residenz Theatre, the Royal (1888–90), the Lessing (1892–94 and after

1902), and the Deutsches (1894–1901). In 1915–16, under the auspices of the Modern Stage and the American People's Theatre, both of which Reicher founded, he had a theatre in New York and presented a number of plays seldom staged. In some of these he himself and his daughter Hedwig had rôles. His son Frank also became known as an actor. Emanuel Reicher, who until 1915 had never played in English, came to be recognized internationally as one of the most distinguished German actors of his day, the leading interpreter of Ibsen, Björnson, Strindberg, and Hauptmann.

REICHERSBERG, rīK′ĕrs-bĕrk, Gerhoh von. See Gerhoh or Gerhoch von Reichersberg.

REICHMANN, rīK′mȧn, Theodor (1849–1903). A German dramatic barytone, born at Rostock. He was educated musically under Elsler, Mantius, Ress, and Lamperti, and soon became famous for his voice, which was of a very dramatic quality. He sang in several important theatres of Germany and Austria, and from 1882 to 1889 he was a member of the Vienna court opera. One of his most famous achievements was his creation of the part of Amfortas at the Bayreuth Festival. In 1889–90 he sang at the Metropolitan Opera House in New York, after which he returned to Vienna.

REICHSRAT, rīKs′rät. 1. The national legislative assembly of the Austrian (Cisleithan) half of the Austro-Hungarian monarchy. See Austria-Hungary. 2. The Upper House of the Bavarian Parliament (Landtag). See Bavaria.

REICHSTADT, rīK′stȧt, Napoléon François Charles Joseph Bonaparte, Duke of (1811–32). The only child of Napoleon I and the Empress Maria Louisa. He is sometimes known as Napoleon II or as l'Aiglon (little eagle). The infant prince was proclaimed King of Rome and baptized in the cathedral of Notre Dame by Cardinal Fesch. After the battle of Waterloo Napoleon abdicated in favor of his son, but the Senate took no notice of Napoleon II and called Louis XVIII to occupy the French throne, whereupon Maria Louisa and her child removed to the palace of Schönbrunn, near Vienna, where they remained till the Treaty of Vienna had rearranged the affairs of Europe. Maria Louisa then proceeded to take possession of the Duchy of Parma, while her son continued to reside at the Austrian court with his grandfather, Francis I. By the Treaty of Paris (1818) it was decreed that Napoleon II should never inherit the domain of his mother. As a recompense he was created Duke of Reichstadt, with the rank of an Austrian prince, by an Imperial patent dated July 22, 1818. He died from an overindulgence in violent exercise and his body was interred in the Imperial tomb at Vienna. Consult Welschinger, *Le roi de Rome, 1811–32* (Paris, 1897), and Wertheimer, *The Duke of Reichstadt* (London, 1905).

REICHSTAG, rīKs′täg. See Germany.

REICK, rīk, William Charles (1864–). An American journalist and newspaper owner. He was born in Philadelphia, where he entered newspaper work in 1883. He served as editor of the London and Paris editions of the New York *Herald* in 1888–89, was city editor of that newspaper from 1889 to 1903 and president of the New York Herald Company in 1903–06, and in 1907–12 was president of the Public Ledger Company of Philadelphia and part owner of the New York *Times.* In 1911 Reick became chief owner of the New York *Sun.*

REID, rēd, Alexander Peter (1836–). A Canadian physician. Born in London, Ontario, he was educated there and in medicine at McGill, Edinburgh, and New York universities. He practiced his profession for a few years in Ontario, but after 1864 lived in Nova Scotia, chiefly at Halifax. He took part in founding Halifax Medical College and in procuring the improvement of the provincial laws in reference to the study and practice of medicine. In Halifax Medical College he was professor successively of physiology, the practice of medicine, hygiene, and medical jurisprudence, and for some years was president. In 1878–92 he was superintendent of the Nova Scotia Hospital for the Insane and in 1892 was appointed superintendent of the Victoria General Hospital, Halifax. Reid served as secretary of the Provincial Board of Health from 1893 to 1904, and in the latter year became chief health officer for Nova Scotia. For some years he was a member of the medical faculty of Dalhousie University. He contributed frequently to medical journals.

REID, Clement (1853–). An English geologist, born in London and privately educated. For many years he was district geologist of the England and Wales Survey. He wrote on local geology—of the country around Cromer (1882), of Holderness (1885), of Newquay (1906), of Land's End (1907), etc.; *The Pliocene Deposits of Britain* (1890) and *The Island of Ictis* (1905); but is better known for his investigations of British paleobotany, particularly tertiary, writing *The Origin of the British Flora* (1899), *Submerged Forests* (1910), and, in collaboration with his wife, *Preglacial Flora of Britain* (1907), *Fossil Flora of Tegelen* (1907–10), *The Lignite of Bovey Tracey* (1910).

REID, Daniel Gray (1858–). An American capitalist. He was born at Richmond, Ind., where he became a bank clerk in 1874. In 1895 he was one of the organizers and became president of the American Tin Plate Company. Moving to New York in 1899, he shared in the organization of the National Steel Company, the American Steel Hoop Company, and the American Sheet Steel Company, and when the United States Steel Corporation was formed in 1901 became one of its directors and a member of its executive committee. Reid became a director also of the Rock Island lines, but in 1915 he resigned as chairman of the board of directors of the main road, the Chicago, Rock Island, and Pacific, after criticisms by stockholders of the methods in use and the resulting disclosures had necessitated a reorganization.

REID, Sir George (1841–1913). A Scottish portrait, flower, and landscape painter and illustrator. He was born in Aberdeen and studied at the Trustees Academy, Edinburgh, under Mollinger and Israels in Holland and Yvon in Paris. In 1891 he succeeded Douglass as president of the Royal Scottish Academy and was knighted. Reid was essentially a painter of men. His portraits are vigorously handled, vividly characterized, simple in design, and strong and solid in tone, but sometimes lack distinction and grace. Among his many eminent sitters were the Earl of Halsbury, Marquis of Tweeddale, Professor Tait (National Scottish Portrait Gallery), and the lord provosts Ure and Bilsland (Glasgow Gallery). He also painted charming flower pieces and pensively poetic landscapes, silvery in tone and showing a fine appreciation of values, such as "St. Mary's Loch" and "Norham Castle." Finally his pen-and-ink drawings, especially his illustrations for Mrs. Oliphant's *Royal Edinburgh* and Smiles's *Thomas Edward*, place him in the foremost ranks of modern British graphic artists.

REID, George Agnew (1860–). A Canadian genre, figure, and landscape painter, born near Wingham, Ontario. He studied at the Philadelphia Academy and in France, Spain, and Italy. His more important canvases include "Dreaming," "Mortgaging the Homestead," and "Champlain's Arrival at Quebec," all in the National Gallery, Ottawa. He also painted landscapes and gained success in panels for mural decoration. A series of these, "The Pioneers," in the entrance hall of the municipal buildings, Toronto, was presented to the city by Mr. Reid. His work is good in technique and color and shows an individual treatment of atmosphere. He was president of the Ontario Society of Artists in 1897–1901 and president of the Royal Canadian Academy in 1906–09.

REID, Sir George Houstoun (1845–). An Australian political leader, born at Johnstone, Renfrewshire, Scotland. He became a barrister in New South Wales in 1879. In the following year he was elected to the colonial Legislative Assembly, where he continued to sit, with the exception of the year 1884–85, until 1901. After federation he represented East Sydney until 1909. From 1894 to 1899 he was Prime Minister and Colonial Treasurer of New South Wales. After the establishment of the Australian Commonwealth he became leader of the Free Trade party in the federal Parliament and was Premier from August, 1904, to July, 1905. In 1905–06 he conducted an active antisocialist campaign against the Labor party. In 1910–15 he served as High Commissioner for Australia. Reid was created K.C.M.G. in 1909, and was promoted G.C.B. in 1916.

REID, Harry Fielding (1859–). An American geologist, born in Baltimore and educated at the Pennsylvania Military Academy (C.E., 1876) and at Johns Hopkins (A.B., 1880; Ph.D., 1885). Between 1889 and 1896 he was a member of the faculties of the Case School of Applied Science at Cleveland, Ohio, and of the University of Chicago. At Johns Hopkins he was associate professor (1896–1901) and professor (1901–11) of geological physics, and thereafter professor of dynamical geology and geography. Reid was chief of the highway division of the Maryland Geological Survey from 1898 to 1905 and a member of the United States Geological Survey after 1902. Besides preparing special reports he wrote in collaboration *Highways of Maryland* (1899) and contributed to the New International Encyclopædia.

REID, James Smith (1846–). A British classical scholar, born at Sorn, Ayrshire, Scotland, and educated at Christ's College, Cambridge, of which he was fellow from 1870 to 1872 and classical lecturer from 1870 to 1880. He was also classical lecturer of Pembroke College (1873–78, 1880–85) and tutor of Gonville and Caius College (1885–98). In 1899 he became professor of ancient history at Cambridge. Reid edited Cicero's works (the *Cato Maior, Lælius, Pro Balbo,* and especially the *Academica*, a valuable work, 1885). He translated also the *Academica* of Cicero (1880) and the *De Finibus* of Cicero (1883), contributed chapters on Roman history and Roman law to J. E. Sandys's *A companion to Latin Studies* (1910; 2d ed., 1913), and to the *Cambridge Mediæval History*, vols. i–ii (1911 et seq.), and published an elaborate work, *The Municipalities of the Roman Empire* (1913).

REID, (Thomas) Mayne (1818–83). A British writer of hunting romances and tales of adventure, born at Ballyroney, County Down, Ireland, April 4, 1818. His father was a Presbyterian minister and Mayne Reid was educated for the same profession, but the thirst of adventure led him to emigrate to the United States. In 1840 he arrived at New Orleans, where he worked as a storekeeper, negro overseer, and actor. As a hunter and trader among the Indians he gained that knowledge of scenery, manners, and characteristics which he afterward used to advantage in his *Scalp Hunters* (1851), *White Chief* (1859), and many other romances. He devoted five years to travel in the United States. In 1846 he obtained a commission and served with distinction in the Mexican War. In 1849 Reid sailed for Europe to take part in the struggle for independence in Hungary, but arrived on the Continent too late. It was in England that he began his long series of romances. In 1867 he returned to New York and founded the unsuccessful *Onward Magazine*, but from 1870 till his death, Oct. 22, 1883, he again lived in England. Among his many tales of adventure on land and on sea, for which his own extraordinarily adventurous life furnished abundant material, are: *The Rifle Rangers* (1850); *The Desert Home* (1851); *The War Trail* (1857); *The Boy Tar* (1859); *Afloat in the Forest* (1865); *The Castaways* (1870); *Free Lances* (1881). Most of Reid's stories were translated into French and many of them into German. Consult the *Memoir* by his widow, Elizabeth Reid (London, 1890).

REID, Ogden Mills (1882–). An American newspaper owner and editor, son of Whitelaw Reid and grandson of Darius Ogden Mills (qq.v.). He was born in New York City and received his education in Bonn, Germany, and at Yale (A.B., 1904; LL.B., 1907). In 1908 he was admitted to the New York bar, but instead of practicing law he joined the staff of the New York *Tribune*, on which he afterward held a variety of positions, becoming managing editor in 1912 and editor in 1913, in succession to his father. As owner of the *Tribune* (president of the Tribune Association) Ogden Reid was successful in procuring the services of some of the most able editorial, news, and special writers in New York.

REID, Robert (1862–). An American figure and decorative painter, born in Stockbridge, Mass. He studied at the Boston Museum School, the Art Students' League, New York, and under Boulanger and Lefebvre, in Paris. His work as a decorator began with a commission for the Liberal Arts Building at the World's Fair, Chicago (1892). This was followed by decorations in the Massachusetts State House, Boston; Library of Congress, Washington; Appellate Court, New York; Paulist Church, New York; and 20 stained-glass windows for the Rogers Memorial Church, Fairhaven, Mass. His easel subjects, which may be seen in many public galleries in America, are usually slender, graceful girls, surrounded by flowers, such as "Fleur-de-Lis," Metropolitan Museum, New York. He also painted interiors and landscapes. His art is essentially lyric and decorative, and he cares more for color and effects of light than for modeling and form. He received the Hallgarten (1898) and Clarke (1909) prizes of the Academy, a special gold medal for mural decoration at the Paris Exposition of 1900, and a gold medal at the Panama-Pacific Exposition, San Francisco, in 1915. In 1906 he became a member of the National Academy of Design.

REID, SIR ROBERT GILLESPIE (1840–1908). A Canadian railway contractor, born at Coupar Angus, Perthshire, Scotland. In 1865 he went to Australia, where he was interested in gold mining and other ventures, and in 1871 he emigrated to America, had charge of the construction of a large section of the Canadian Pacific Railway, of the international bridge across the Niagara River, the international railway bridge over the Rio Grande, the Lachine Bridge over the St. Lawrence, ¾ mile in length, and of much other important bridge work in the West. In 1893 he contracted with the government of Newfoundland to construct in three years a transinsular railway from St. John's to Port-aux-Basques, to be paid for at the rate of $15,600 a mile, and to operate the line for 10 years in return for alternate, 5000-acre blocks of land along the railway, one for each mile built. In 1898 Reid contracted to operate all the Newfoundland railways for 50 years on condition of receiving a land grant of 2,500,000 acres, the government telegraph lines, and the ownership of the railways at the expiry of the 50 years. Reid's contract attracted wide public attention, and the Newfoundland Governor, fearing popular discontent, refused to ratify it. Sir James Winter, the Conservative Premier, was defeated on account of this support of Reid, and Sir Robert Bond, who succeeded him, procured a modified contract which transferred the Reid property to a company, safeguarded private rights, and provided for the restoration of the railways to the colony after 50 years, under equitable conditions. Reid was knighted in 1907.

REID, ROBERT THRESHIE, first EARL LOREBURN (1846–). A British politician and jurist, born at Dumfries, Scotland. He studied at Oxford, was called to the bar in 1871, and in 1880 entered Parliament from Hereford. From 1886 to 1905 he sat as a Liberal for Dumfries. He served as Solicitor-General in 1894, Attorney-General in 1894–95, and was one of the British counsel before the Venezuelan Boundary Commission. From 1905 to 1912 Reid held the post of Lord Chancellor. He was knighted in 1894, was created G.C.M.G. in 1899, became first Baron Loreburn in 1906, and first Earl Loreburn in 1911. He is author of *Capture at Sea* (1913). Consult A. G. Gardiner, *Prophets, Priests, and Kings* (London, 1908; new ed., Wayfarer's Library, ib., 1914).

REID, SAMUEL CHESTER (1783–1861). An American privateersman, born in Norwich, Conn. He went to sea at the age of 11, and on his first voyage was captured by a French frigate and confined for six months in Guadaloupe. Subsequently he entered the United States navy and served on the *Baltimore* under Commodore Thomas Truxtun in the West Indies. During the War of 1812 he commanded the privateer *General Armstrong*. On Sept. 26–27, 1814, in the neutral harbor of Fayal, Azores, the *General Armstrong* was attacked by three British vessels of superior strength. Reid inflicted a loss of 120 killed and 180 wounded on the enemy and retreated to the shore. The entire American loss was 2 killed and 7 wounded. The question of violation of the neutrality of Fayal was decided against the American contention. Subsequently, however, the British government apologized for the breach of neutrality. Reid was for many years warden of the port of New York. He invented and built the signal telegraph at the Battery and the Narrows, planned the United States flag, adopted in 1818, providing for 13 permanent stripes and for stars increasing with the admission of new States.

REID, THOMAS (1710–96). A leading philosopher of the Scottish school. He was born April 26, 1710, at Strachan, Kincardineshire, began his education in the parish school of Kincardine, and at the age of 12 became a student at Marischal College in Aberdeen. He took his degree of M.A. in 1726, and continued to reside in Aberdeen as college librarian. In 1737 he was presented by the senatus of King's College to the parish church of New Machar in Aberdeenshire. He had fully adopted the idealism of Berkeley, but was revolted by the conclusions drawn from it by Hume, and in consequence was led to seek a new foundation for the common notions as to a material world. In 1752 he was appointed one of the professors of philosophy in King's College, Aberdeen. Here he taught mathematics, natural philosophy, and moral philosophy. In 1763 he was chosen to succeed Adam Smith as professor of moral philosophy in the University of Glasgow. He now confined himself to teaching metaphysics and psychology. In 1764 he published his *Inquiry into the Human Mind on the Principles of Common Sense*. He continued in the duties of his chair till 1781, when he devoted his remaining strength to the publication of his works on the mind. In 1785 the *Essays on the Intellectual Powers* appeared, and in 1788 *Essays on the Active Powers*. The distinguishing feature of his philosophy was the assertion of certain irresistible convictions which are due to intuitions. Among them are the conviction as to the real existence of an external world, as to the causal connection of phenomena, as to the moral character of actions and the existence of the soul. Reid's works were edited with a *Life* by Dugald Stewart (Edinburgh, 1804) and by Sir William Hamilton (8th ed., ib., 1880). Consult: James McCosh, *Scottish Philosophy from Hutcheson to Hamilton* (New York, 1875); Andrew Seth, *Scottish Philosophy* (2d ed., Edinburgh, 1890); E. H. Sneath (ed.), *The Philosophy of Reid* (New York, 1892); A. C. Fraser, *Thomas Reid* (Edinburgh, 1898). See COMMON SENSE.

REID, SIR (THOMAS) WEMYSS (1842–1905). An English journalist and author, born at Newcastle-on-Tyne and educated there. Having entered journalism in 1861, he edited the Leeds *Mercury* for 17 years. In 1887 he resigned to become manager of Cassell & Co., publishers, a position he held for the rest of his life. From 1890 to 1899 he edited the *Speaker*. In 1894 he was knighted. He wrote, notably: *Cabinet Portraits* (1872); *Charlotte Brontë* (1877); *Politicians of To-Day* (1879); *The Land of the*

Bey (1882); *Life of W. E. Forster* (2 vols., 1888); *Life of Richard Monckton Milnes* (1890); *Life of Lord Playfair* (1899); *Life of William Black* (1902). He also edited a two-volume *Life of Gladstone* (1899). Two successful novels came from his pen—*Gladys Fane* (1884) and *Maulverer's Millions* (1886). Consult his *Memoirs, 1842–1885* (New York, 1905), edited by his brother, Dr. Stuart Reid.

REID, WHITELAW (1837–1912). An American journalist, diplomat, and writer. He was born at Xenia, Ohio, Oct. 27, 1837, graduated at Miami University (1856), and immediately entered journalism and local politics. For a time he edited the Xenia *News.* He was a captain and volunteer aid on the staff of Maj. Gen. Thomas A. Morris and afterward on that of Rosecrans (1861). He served as correspondent of the Cincinnati *Gazette* during the Civil War, and was afterward chosen librarian of the House of Representatives (1863–66). He then experimented with cotton planting in Louisiana, at which time he wrote *After the War* (1866). After his return to Ohio he published *Ohio in the War* (1868). He next joined the staff of the New York *Tribune* and, succeeding Horace Greeley in 1872, became its editor and principal owner. His successor in control of the *Tribune* was his son, Ogden Reid (q.v.). In 1881 Mr. Reid married a daughter of the financier, Darius Ogden Mills. He twice declined appointment as Minister to Germany, but he accepted the nomination for Vice President (1892) and the appointments of Minister to France (1889–92) and Special Ambassador to Queen Victoria's Jubilee (1897). He was also a member of the Peace Commission that terminated the Spanish War (1898) and Special Ambassador to Great Britain for the coronation of Edward VII (1902). Elected a life member, in 1878, of the New York State Board of Regents, he became vice chancellor (1902) and chancellor (1904) of the University of the State of New York. In 1905 President Roosevelt appointed him American Ambassador to Great Britain, where he was much appreciated, not only as a diplomat, but as a speaker, both at dinners and before learned societies. Though his personal tastes were simple, he lavished his wealth in splendid entertainments at the American Embassy and became a popular and conspicuous figure in the social life of London. Mr. Reid was honored with degrees by several universities at home and abroad. He died in London, Dec. 15, 1912. Among his writings are: *Schools of Journalism* (1871); *The Scholar in Politics* (1873); *Some Newspaper Tendencies* (1879); *Town Hall Suggestions* (1881); *Our New Duties* (1899); *A Continental Union* (1900); *The Monroe Doctrine* (1903); *The Greatest Fact in Modern History* (1906); *How America Faced its Educational Problem* (1906); *The Scot in America* (1912); *American and English Studies* (2 vols., 1913).

REID, SIR WILLIAM (1791–1858). A British soldier, administrator, and meteorologist, born at Kinglassie, Fifeshire. He was educated at the Royal Military Academy, Woolwich, was commissioned lieutenant of engineers in 1809, and in 1810 joined Wellington's army at Lisbon. In 1815 he participated in Sir Edward Pakenham's unsuccessful attack on New Orleans and in 1835 commanded a brigade in the British Legion raised by the Queen Regent of Spain. Subsequently Reid served as Governor of the Bermudas (1839–46), of the Windward Islands, (1846–48), and of Malta (1851–58). He was knighted in 1851 and promoted to major general five years later. He published *An Attempt to Develop the Law of Storms by Means of Facts* (1838; 3d ed., 1850) and *The Progress of the Development of the Law of Storms and of the Variable Winds* (1849).

REIDSVILLE. A city in Rockingham Co., N. C., 24 miles southwest of Danville, Va., on the Southern Railway (Map: North Carolina, C 1). Located in the heart of the old tobacco belt, the city receives and manufactures tobacco goods of excellent quality. There is also a large cotton mill. The town, first settled about 1860, was incorporated in 1873. Pop., 1900, 3262; 1910, 4828.

REIFFERSCHEID, rī′fĕr-shīt, AUGUST (1835–87). A German classical scholar, born and educated in Bonn. He received a traveling fellowship in archæology from the University of Bonn; spent 1861–66 mostly in Italy, being part of the time charged by the Vienna Academy to make researches for the *Corpus Scriptorum Ecclesiasticorum Latinorum;* and was professor at Breslau (1868–85) and from 1885 at Strassburg. His works include: *Suetoni præter Cæsarum Libros Reliquiæ* (1860), the standard edition of these fragments; *Bibliotheca Patrum Latinorum Italica* (1865–72); *Arnobius* (1875); an edition of Anna Comnena's *Alexiad* (1878); and a partial edition of Tertullian (edited by Wissowa, 1890).

REIGATE, rī′gĕt. A municipal borough and market town in Surrey, England, at the base of the North Downs, 23 miles south of London (Map: England, F 5). From early times it was considered a place of strength; and after the Conquest it was granted to the earls of Warrenne. The parish church is in various styles of architecture, the oldest portions dating from the twelfth century. Trade is chiefly agricultural. Near by are quarries of freestone and hearthstone and supplies of fuller's earth and of silver sand for manufacturing glass. Pop., 1901, 25,993; 1911, 28,502.

REIGHARD, rī′gärd, JACOB ELLSWORTH (1861–). An American zoölogist, born at Laporte, Ind. He graduated at the University of Michigan in 1882 and then studied at Harvard and Freiburg. After serving as instructor and assistant professor in zoölogy at the University of Michigan, he was appointed professor of animal morphology in 1891, and after 1895 was professor of zoölogy and director of the zoölogical laboratory of the University. He was in charge of the Michigan Fish Commission in 1890–95, and from 1898 to 1901 was director of the biological survey of the Great Lakes under the United States Fish Commission. Besides numerous papers on fresh-water biology, behavior of fishes, etc., he published, in collaboration with H. S. Jennings, *The Anatomy of the Cat* (1901).

REIGN OF TERROR. That period of the French Revolution beginning with the fall of the Girondists (q.v.) in June, 1793, and terminating with the overthrow of Robespierre (q.v.), July 27, 1794. See FRENCH REVOLUTION.

REIMARUS, rī-mä′ru̧s, HERMANN SAMUEL (1694–1768). A German naturalistic philosopher. He was born in Hamburg, Dec. 22, 1694, studied at the universities of Jena and Wittenberg, traveled afterward in Holland and England, and on his return was elected rector at the Gymnasium of Wismar (1723) and in 1728 professor of Hebrew and mathematics at the Gymnasium of Hamburg. He died there March 1, 1768. He is the author of the so-called *Wolfenbüttelsche Fragmente eines Unbekannten,* first published by Lessing in his *Beiträge zur Geschichte und Litteratur aus den Schätzen der Wolfenbüttelschen Bibliothek* (1774, 1777–78). These *Fragmente,* up to that time known only in manuscript by a few of Reimarus' most intimate friends, produced a sensation throughout Germany, since the author, in the boldest and most trenchant manner, denied the supernatural origin of Christianity. They were partially translated as *Fragments from Reimarus* (London, 1879). A cognate work is his *Vornehmste Wahrheiten der natürlichen Religion* (1754). His edition of Dio Cassius, partly from materials left by his father-in-law, J. A. Fabricius (q.v.), is one of the most valuable contributions to classical philology (1750). An English translation of a part of the *Fragments* was edited by C. Voysey (London, 1879). Consult: D. F. Strauss, *H. S. Reimarus und seine Schutzschrift für die vernünstigen Berehrer Gottes* (2d ed., Bonn, 1877); G. C. B. Punjer, *History of Christian Philosophy of Religion since Kant,* English translation by W. Hastie (New York, 1888); B. Brandl, *Die Ueberlieferung der "Schutzschrift" des H. S. Reimarus* (Pilsen, 1907).

REIMER, rī′mẽr, Josef Ludwig (1879–). An Austrian writer. He was born at Vienna and studied law at the universities of Vienna and Grenoble. Reimer traveled extensively in foreign countries. He is one of the three writers cited by Emil Reich (q.v.) as supporting his interpretation of Pan-Germanism. His writings include: *Ein pangermanisches Deutschland* (1905); *Grundzüge deutscher Wiedergeburt* (1906); *Kommt Hellas wieder?* (1912), a dramatic poem.

REIMS, rēms, *Fr. pron.* răɴs. A city of France. See Rheims.

REIN, rīn, Johann Justus (1835–). A German geographer, born at Raunheim-on-the-Main and educated in mathematics and science at the University of Giessen. He made various scientific journeys in Europe, Asia, and America, and was professor of geography at the University of Marburg in 1876–83, and thereafter until his retirement in 1911 at Bonn. His publications include *Japan, nach Reisen und Studien* (1881–86), which was translated into English by the author himself under the title *Japan: Travels and Researches* (1884–89); *Columbus und seine vier Reisen nach Westen* (1892); *Beiträge zur Kenntniss der spanischen Sierra Nevada* (1899); *Abriss der Warenkunde* (1900).

REIN, Wilhelm (1847–). A German educator and author, born at Eisenach. He studied at Heidelberg, Leipzig, and Jena, for several years was teacher at Weimar, and from 1876 to 1886 was principal of a school in Eisenach. In 1886 he was appointed professor of pedagogy at the University of Jena. Rein is an authoritative expounder of Herbartianism, especially as applied to elementary schools. He ranks among the foremost of educational theorists, and exerted great influence on the educational institutions of his country. His principal works are: *Theorie und Praxis des Volksschulunterrichts* (1879–93); *Pädagogik im Grundriss* (1892); *Grundriss der Ethik* (1906); *Encyklopädisches Handbuch der Pädagogik* (7 vols., 1895–99; 2d ed., 10 vols., 1902–10); *Pädagogik in systematischer Darstellung* (3 vols., 2d ed., 1911); *Das Kind* (2 vols., 2d ed., 1911). He edited Niemeyer's *Grundsätze der Erziehung* (1878–79) and founded the educational journal *Pädagogische Studien* in 1880.

REINACH, rī′näk, Joseph (1856–). A French publicist, a brother of Salomon Reinach. He was born in Paris, Sept. 30, 1856, studied at the Lycée Condorcet and in the faculty of law of the University of Paris, and was admitted to the bar in 1877. Reinach wrote for the *Dix-neuvième Siècle* and for Gambetta's *République Française,* and in 1881–82 was private secretary to Gambetta, who was then president of the cabinet council. Having reëntered journalism, in 1886 he became proprietor with Deynarouse of the *République Française,* in which he supported the Union-Republican group. In 1889 he was elected, as a Liberal-Republican, deputy for Digne (Basses-Alpes), in 1893 was reëlected, but in 1898 failed of reëlection because of his attitude in the Dreyfus case. It was not until 1906 that he was again elected for Digne, after a hotly fought contest. In 1910 he was reelected. Reinach denounced the introduction of secret documents into the Dreyfus trial of 1894, the forgeries of Paty du Clam and Henry, and the complicity of the latter with Esterházy, and was associated with Scheurer-Kestner in the movement for revision. He published on the case several pamphlets (combined and republished in *Affaire Dreyfus,* 1898–99); also *Tout le crime* (1900), *Histoire de l'affaire Dreyfus* (6 vols., 1901–04), the great authority on the subject, and *Les nouvelles catilinaires* (1905). The brochure *Les enseignements de l'histoire* originally appeared in the *Siècle,* and caused Reinach to be expelled from his captaincy in the territorial army for "a gross offense against discipline" and to be deprived of the decoration of the Legion of Honor. Among his further publications are: *La Serbie et le Montenegro* (1876); *Voyage en Orient* (1879); *Le ministère Gambetta* (1884); *Etudes de littérature et d'histoire* (1888–89); *Les petites catilinaires* (1889); three series of collected articles against Boulanger; several essays and reports on the reorganization of the French artillery; *Mes comptes rendus* (1911); *La réforme électorale* (1912). He also edited *Discours et plaidoyers politiques* (11 vols., 1881–85) and *Dépêches, circulaires, décrets, proclamations, et discours* (1886), both by Gambetta.

REINACH, Salomon (1858–). A French archæologist, brother of Joseph Reinach, born at Saint-Germain-en-Laye (Seine-et-Oise). He studied at the Lycée Fontanes and the Ecole Normale Supérieure, was appointed to the French Classical School of Athens (Ecole Française d'Athènes), and made interesting excavations and discoveries at Myrina, near Smyrna, and elsewhere (1880–82). In 1886 he became attaché in the Museum of National Antiquities at Saint-Germain-en-Laye (later curator), in 1890–92 was assistant professor of national archæology at the Ecole du Louvre (later professor), and in 1893 was appointed associate curator of the National Museums. He was elected to the Académie des Inscriptions et Belles-Lettres in 1896, and of this academy was president in 1906. He edited a careful text (1877) of St. Augustine's *De Civitate Dei.* His publications include: *Chronique d'Orient* (1885–91), cataloguing all discoveries made in Greece to that date; *La nécropole de Myrina* (1887), with Pottier; *Description raisonnée du musée de Saint-Germain*

(1890); *Les Celtes dans les vallés du Pô et du Danube* (1894); *Répertoire de la statuaire greeque et romaine* (5 vols., 1897–1910); *Guide illustré du musée national de Saint-Germain* (1899); *Story of Art throughout the Ages*, English translation by Simmonds (1904); *Répertoire des peintures* (1905–10); *Répertoire des reliefs* (3 vols., 1910–13); *Cultes, mythes, et religions* (4 vols., 1904–13). In all he published more than 60 volumes and 3000 articles, of which there is a printed catalogue (new ed., Paris, 1914). Reinach's general history of art, *Apollo*, was translated into English, Spanish, Italian, and Hungarian, and his history of religion, *Orpheus*, into English.

REINAUD, rā̊'nō', JOSEPH TOUSSAINT (1795–1867). A French Orientalist, born at Lambesc (Bouches-du-Rhône). He was a pupil of Sylvestre de Sacy, and was appointed curator of the Royal Library in 1834. He was also president and (after 1838) De Sacy's successor as professor of Arabic at the Ecole des Langues Orientales Vivantes (1838–67). In 1832 he became a member of the Academy of Inscriptions, and from 1847 to his death he was president of the Société Asiatique. Reinaud published: *Monuments arabes, persans, et turcs du cabinet de M. le duc de Blacas et d'autres cabinets* (1828), a work of great value, especially in the province of epigraphy; a version of Raymond Lully's *Livre de la loi au Sarrazin* (1831), with Michel; *Extraits des historiens arabes relatifs aux guerres des croisades* (1829); *Invasions des Sarrazins en France* (1836); the text and a French version of Abulfeda's geography (1840–48), with Slane; *Fragments arabes et persans inédits relatifs à l'Inde* (1845), with translation; *Du feu grégeois* (1845), with M. Favê; *Relation des voyages faits par les Arabes et les Persans dans l'Inde et Chine* (1846); *Relations politiques et commerciales de l'empire romain avec l'Asie orientale* (1863).

REIN'DEER' (Icel. *hreinn*, AS. *hrān*, reindeer, from Lapp *reino*, pasturage + *deer*, AS. *dēor*, Goth. *dius*, wild beast, animal, Ger. *Thier*, animal). An Arctic deer (*Rangifer tarandus*) which has long been domesticated and used as a draft animal and a beast of burden in Northern Europe. The wild race still exists in varying abundance almost everywhere from Northern Scandinavia to Eastern Siberia, wandering to the Arctic coast and throughout Spitzbergen, Nova Zembla, and the Phipps and Parry islands. They are not known much south of Lapland in the west, nor below the northern margin of the great forest region in Siberia, but in the Ural region they wander southward to the borders of Perm. Whether the caribou (q.v.) of Greenland and Canada are to be regarded as merely geographical races of the European form, thus considered as a circumpolar species, is a matter of opinion. European zoölogists generally have, in the past, considered that the differences between European and American examples are not sufficient to be deemed specific. Merriam and other recent American zoölogists think otherwise and set apart four species and a number of subspecies in the New World. Within historic times reindeer lived in the islands north of Scotland, but became extinct there before the twelfth century; they were much more recently numerous throughout Scandinavia. The habits of the American species are outlined under CARIBOU. Those of the plains and islands of subarctic Europe and Asia wander about the tundras and desolate treeless mountains, making periodical migrations from one feeding-ground to another. In early summer the Spitzbergen herds betake themselves to the grassy valleys of the interior, whence they return in the autumn to the coast to feed upon seaweed. The coming of the winter ice cuts off this resource, compelling them to go into the mountains, where they subsist upon the rock-lichens, which they uncover by shoveling away several feet of snow with their flat horns, or pawing it aside with their feet. The alternate thawing and freezing of spring, by forming a hard crust on the snow, interferes sadly with their welfare, and great numbers sometimes starve at this season. In Siberia, as in North America, migrations in scattered herds regularly take place from the barren coast plains southward to the less inclement region along the borders of the forest area, where food may be obtained. Not much is known of the breeding habits of the wild reindeer except that the fawns are born in the spring.

The reindeer has long been domesticated among the Laplanders and the tribes along the coast of Siberia, and used for drawing sledges and as a riding and burden animal, besides furnishing skins for tents, clothing and harness, flesh and milk for food, and horns and hoofs for various utilities. It has remarkable endurance, strength, and speed in drawing sledges, and without this animal much of Lapland and Siberia could not be permanently inhabited. These qualities led the government of the United States to endeavor to naturalize reindeer among the Eskimos of the north coast of Alaska, who were in danger of starving through the loss of food and uneconomical habits, as a consequence of excessive whaling and walrus-hunting by white men off that coast. The experiment was conducted under the direction of the Commissioner of Education and the personal care of the Rev. Sheldon Jackson. Agents procured a small herd of Siberian reindeer which, with Lapp attendants, were landed in Northern Alaska in 1889. The training of Alaskan attendants and drivers was begun, and more herds were annually imported. Up to 1898, 550 deer had been brought from Siberia, and the stock with its increase amounted to about 5000 in 1903. Several stations were established where the deer were bred, and where Eskimos were trained in their care and use. The history of the attempt is contained in Jackson's *Annual Reports* to the Department of the Interior, from 1890 onward. A bulletin states that in 1914 there were 47,266 reindeer in Alaska, distributed among 62 herds. Of these animals 30,532 are owned by natives. In fact, within a period of twenty years the reindeer industry has made the Eskimos of Alaska civilized and thrifty men. In the year 1915 the first roundup of reindeer was made near Nome. Calves were branded and herds divided and shifted to new pastures. One hundred animals were killed and their flesh shipped south for market use. It was estimated that two thousand carcasses would be available the next year, and this phase of the industry promises to be one of great importance.

The wild reindeer is much larger than the domesticated races. It is as large as the stag, but heavier and more clumsy in appearance. It has a dark coat in summer and a lighter one in winter, with a growth of long whitish hair under the neck, while the region about the short goatlike tail and the outlines of the hoofs are nearly white. It constitutes a genus (*Rangifer*), differing from that of ordinary deer in the important particular that both sexes have horns, although those of the bucks are larger. These antlers are peculiar in their long, slender, unequally branching beams, and especially in the fact that the brow-tines are greatly produced and palmated, and one is usually aborted to allow the other to push forward into a formidable weapon, overhanging the face.

During Pleistocene time the reindeer was more widely distributed over Europe than it is at the present day, for its fossil remains have been found as far as the Alps and the Pyrenees.

Bibliography. Boyd Dawkins, *Cave Life* (London, 1875); N. A. Nordenskiöld, *Voyage of the Vega* (New York, 1881); Richard Lydekker, in *Royal Natural History*, vol. ii (London, 1896); id., *Deer of All Lands* (ib., 1898); and the works of travelers and explorers in the Arctic regions and the countries where reindeer are used. For the American forms: Theodore Roosevelt, *The Deer Family* (New York, 1902); Preble, "Biological Investigation of the Hudson Bay Region," in *North American Fauna No. 22* (Washington, 1902); E. T. Seton, *Life Histories of Northern Animals* (New York, 1909); Stone and Cram, *American Animals* (new ed., ib., 1914); and books cited under Deer and Caribou.

REINDEER MOSS (*Cladonia rangiferina*). A lichen of great importance to inhabitants of the northernmost regions of the Northern Hemisphere, where it covers great areas and furnishes the chief winter food of the reindeer. It is found in almost all parts of the world, but is most abundant and luxuriant in arctic and subarctic regions, often occupying the ground in pine and spruce forests. When such forests are destroyed by fire it soon reappears. It is a variable plant, but always consists of a much-branched, erect, cylindrical, tubular thallus, and attains a height of two inches or more. Its importance was first brought into notice by Linnæus in his *Flora Lapponica*. It is sometimes used for human food. Its taste is pleasant, although attended with a slight pungency or acridity. It is generally boiled in reindeer milk. Its nutritious qualities depend chiefly on a form of starch, lichenin, which it contains. In northern Russia it is used in the manufacture of alcohol. See Plate of Lichens and Colored Plate of Mosses and Lichens with the article Musci.

REINECKE, rī′nĕk-*e*, Karl (1824–1910). A German composer and pianist, born at Altona. He studied with his father, Johann Peter Rudolph Reinecke, a musical composer and director. He was court pianist to Christian VIII at Copenhagen from 1846 to 1848. He became teacher at the Cologne Conservatory in 1851, and occupied at later times the positions of musical director at Barmen, academic musical director and conductor of the Singakademie at Breslau. From 1860 to 1895 he conducted the Gewandhaus Concerts at Leipzig, and at the same time was teacher at the Conservatory; this latter post he held until his retirement from all active work in 1902. He was notable as an enthusiastic interpreter of the works of Mozart. His compositions are both refined and classic throughout, but possess here and there a marked touch of the romantic. Among his works are: a grand opera, *König Manfred* (1867); the operetta, *Ein Abenteuer Händels* (1874); two comic operas, *Auf hohen Befehl* and *Der Gouverneur von Tours* (1886 and 1891 respectively); a number of orchestral overtures, several choral works with orchestra; much excellent chamber music; and piano pieces for two and four hands.

REINECKE FUCHS. See Reynard the Fox.

REINFORCED CONCRETE. See Concrete.

REINHARDT, rīn′härt, Max (1873–). A German theatrical director, whose ideas and methods were influential both in Europe and in America. He was born at Baden, near Vienna. After leaving the Gymnasium he began life as a bank clerk, but was attracted to the stage, and in 1894 appeared at the Deutsches Theater in Berlin, of which subsequently he became director. He established a cabaret; then the Berlin Kleines Theater; then "Die Kammerspiele." Between 1902 and 1912 he produced, among other dramas, Oscar Wilde's *Salome*, G. B. Shaw's *Cæsar and Cleopatra*, Wedekind's *Erdgeist*, Goethe's *Faust*, parts I and II, several plays of Shakespeare, the *Œdipus Rex*, the fine Oriental pantomime *Sumurun* (seen in New York in 1912), and various spectacles or spectacular fantasies, notable among which was *The Miracle* (1912). Reinhardt's prime aim was to bring the spectator intimately into the action of the drama, and send him through a play side by side, as it were, with the actors. To this end he resorted to various devices, among them the "apron" stage (see Theatre). Though Reinhardt's stage effects were often splendidly impressive, the first decorative law of his theatre was simplicity. The scenery, according to him, required large severe lines, and should be suggestive or symbolical rather than minutely realistic. For his effects he relied much on light and color, and especially on ingenious use of electric lighting. Consult: Paul Legband, *Das Deutsche Theater in Berlin* (Munich, 1910); Siegfried Jacobson, *Max Reinhardt* (Berlin, 1910); and Huntly Carter, *The Theatre of Max Reinhardt* (New York, 1914).

REINHART, rīn′härt, Charles Stanley (1844–96). An American illustrator, and genre and landscape painter. He was born in Pittsburgh and studied in Paris, and at the Royal Academy, Munich (1868–1879). Upon his return to America he illustrated for various foreign and American magazines, and frequently exhibited works in oil, water-colors, and black-and-white at the National Academy. From 1881 to 1891 he resided in Paris, exhibiting regularly at the Salon. His oils and water-colors are mostly marine views, painted in sombre but delicate colors. Among the best known are: "The Old Life Boat" (1880); "Mussel Fisherwomen" (1886); "Washed Ashore" (1887), which won the gold medal (Philadelphia, 1888); and the "Rising Tide" (1888), purchased by the government at the Paris Exposition, 1889. His water-colors include "Gathering Wood" (1877), "At the Ferry" (1878), and the "Spanish Barber" (1884). Reinhart excelled especially in black-and-white sketches and illustrations, executed in a forceful and highly characteristic manner. Among his chief works in this medium are the "Reichstag Sketches," "A Little Swiss Sojourn," and "Americans Abroad," and illustrations for Warner's *Their Pilgrimage* and Lathrop's *Spanish Vistas*.

REINHART VON GRÜNINGEN, fôn grụ′nĭng-*e*n. See Grüninger, Johann.

REINHOLD, rīn′hōlt, Christian Ernst (1793–1855). A German philosopher, son of Karl Leonhard Reinhold, born at Jena. He at first lectured on philosophy at the University of Kiel, and afterward was appointed professor of logic and metaphysics at the University of Jena. His philosophical system resembles Kant's. He published: *Handbuch der allgemeinen Geschichte der Philosophie* (3 vols., 1828–29; 4th ed., 1854, under the title *Geschichte der Philosophie nach den Hauptmomenten ihrer Entwickelung*); *Theorie des menschlichen Erkenntnisvermögens und Metaphysik* (1832–34); *Lehrbuch der Geschichte der Philosophie* (1836; 3d ed., 1849), a work of much value; and *System der Metaphysik* (3d ed., 1854). Consult Apelt, *Ernst Reinhold und die kantsche Philosophie* (Leipzig, 1840).

REINHOLD, Karl Leonhard (1758–1823). A German philosopher, born in Vienna. In 1772 he entered the Jesuit College of St. Anna, but upon the suppression of this Order in 1774 he joined the Barnabites, and was for some years an inmate of their College of Saint Michael. His religious zeal in the meantime had cooled considerably, and in 1783 he left the Order and went to Leipzig, where he devoted himself to philosophy. Afterwards he settled in Weimar. His contributions to the *Deutscher Merkur* attracted much attention, and in 1787 his *Briefe über kantsche Philosophie* appeared in this periodical. His clear and eloquent exposition of Kant's doctrines, which at that time were being combated, resulted in his being appointed to a professorship of philosophy in Jena. In 1789 he published his chief work, *Versuch einer neuen Theorie des menschlichen Vorstellungsvermögens,* in which he attempts to broaden the teachings of Kant. He then for a time identified himself with Fichte's doctrines and even tried afterward in his *Paradoxien der neuesten Philosophie* (1799) to find a middle way between Fichte and Jacobi in order to satisfy his religious sentiments, but he deserted both and accepted the rational idealism of Bardili when the latter's *Logik* appeared in 1800. The reason for this change he gives us in his treatise *Wahrheit* (1820).

REINICKE, rī′nĭk-e, René Paul (1860–). A German painter and draftsman, born at Strenz-Naundorf, near Halle. He studied at Weimar under Struys, at Düsseldorf under Gebhardt, and at Munich under Piglhein, whom he accompanied to Palestine. Settled afterward in Munich, he found the true field for his talent in drawing sketches for the *Fliegende Blätter,* in which his masterly delineations from the social life of the upper classes in its various aspects soon became an eagerly looked-for specialty. A selection of his drawings was published in Munich (1890) under the title "Spiegelbilder aus dem Leben." His painting "Waiting Room in the Munich Railway Station" is in the National Gallery, Berlin, and he is also represented in many other German galleries. He was awarded a gold medal at Weimar in 1882 and at Berlin in 1897.

REINKENS, rīn′kĕns, Joseph Hubert (1821–96). The first Old Catholic Bishop. He was born at Burtscheid, near Aix-la-Chapelle, studied theology at Bonn, was ordained priest of the Roman Catholic church, and in 1853 was appointed associate professor and, in 1857, full professor of Church history at Breslau. In 1870 he united with Döllinger in the Old Catholic movement, was suspended by the Bishop of Breslau, and the students were forbidden to attend his lectures. In 1873 he was consecrated Bishop at Rotterdam by the Jansenist Bishop of Deventer. He soon took the oath of allegiance to the government, and was recognized by Prussia as a Catholic bishop, with his residence at Bonn, and remained there in this capacity till his death. He was largely instrumental in organizing the Old Catholic movement into a church. His publications include: *Hilarius von Poitiers* (1864); *Martin von Tours* (1866); *Revolution und Kirche* (1876); *Melchior von Diepenbrock* (1881); *Lessing über Toleranz* (1883). English translations have appeared of his *First Pastoral Letter and Speech on Bible Reading* (1874) and *Speeches on Christian Union and Old Catholic Prospects* (1874). Consult: W. Beyschlag, *Bischof D. Reinkens und die deutsche Alt-katholizmus* (Berlin, 1896), and J. M. Reinkens, *J. H. Reinkens: Ein Lebensbild* (Gotha, 1906). See Old Catholics.

REINMAR VON HAGENAU, rīn′mär fōn hä′ge-nou (?–c.1210). A German poet, one of the first of the minnesingers, usually called Reinmar the Old. From Hagenau he went to Vienna and there taught Walther von der Vogelweide (q.v.), with whom he may have made the Crusade of 1190. His poetry, artificial, sad, and "pale-hued," won him the title of the "Nightingale of Hagenau" from Gottfried von Strassburg, a panegyric from his pupil Walther, and from Uhland high praise for its sentiment and diction. His works are published in Lachmann and Haupt's *Des Minnesangs Frühling* (4th ed., 1884). Consult: Schmidt, *Reinmar von Hagenau* (Strassburg, 1874); Burdach, *Reinmar der Alte und Walther von der Vogelweide* (Leipzig, 1880).

REINSCH, rīnsh, Paul Samuel (1869–). An American political scientist and diplomat. He was born in Milwaukee, Wis., of German-American parents. He graduated at the University of Wisconsin in 1892, at the law school of the same institution in 1894, and after being admitted to the bar practiced for some time in Milwaukee. Returning to the State University in 1895, he became an instructor and extension lecturer in history, pursuing graduate studies at the same time. In 1899 he was appointed assistant professor of political science, and in 1901 professor of political science. In 1913 he became United States Minister to China. Before and after that date he served as delegate to various international conferences. His publications include: *The Common Law in the Early American Colonies* (1899); *World Politics at the End of the Nineteenth Century* (1900); *Colonial Government* (1902); *Colonial Administration* (1905); *American Legislatures and Legislative Methods* (1907); *Readings on American Federal Government* (1909); *Readings on American State Government* (1911); *Civil Government* (1909); *Intellectual and Political Currents in the Far East* (1911); *Public International Unions* (1911). He was a contributor to the New International Encyclopædia.

REIS, rīs, Philipp (1834–74). A German physicist, born at Gelnhausen. In 1858 he became a teacher in the Garnier Institute, near Homburg, and there, after two or three years of research, in 1860 he produced the first telephone. It transmitted musical tone and somewhat indistinctly, though, it is claimed, intelligibly, human speech. In 1885 a monument was erected to him in his native town. Consult Thomson's English version of the sketch by Schenk (London, 1883).

REISEBILDER, rī′ze-bĭl′dẽr (Ger., pictures of travel). A work by Heinrich Heine in four volumes (1826–31). Some of the poems interspersed through the work were published later with others under the title of *Buch der Lieder*.

REIS EFFENDI, rīs ĕf-fĕn′dĭ (Turk., presiding official). A title formerly given to an officer of state in the Ottoman Empire. He was the Chancellor of the Empire and Minister of Foreign Affairs.

REISEN, rī′zen, Abraham (1875–). A popular Yiddish poet and short-story writer, who was born in Russia but settled in the United States. He received the traditional Jewish orthodox education, but soon took up the study of general literature and devoted himself to writing, contributing to and editing a number of Yiddish periodicals in Europe and America. In 1901 the first collection of his verse, *Occasional Poems*, met with considerable success. This was followed by *Stories and Portraits*, equally well received. An incomplete edition of his works appeared in 1908–13 (4 vols., Warsaw and Cracow). Some of his writings have appeared in translation. Like most of his contemporaries among Yiddish writers, Reisen is a realist, his special sphere being the life of workingmen. Many of his lyrics have been set to music.

REISIG, rī′zĭk, Carl Christian (1792–1829). A German classical scholar. He served against Napoleon in 1813–15, then studied at the University of Jena and was professor at Halle (1820–29). He published a critical edition of the *Clouds of Aristophanes* (1820) and a full commentary on the *Œdipus Coloneus* of Sophocles (3 vols., 1820–23). His valuable lectures on Latin grammar were published, with supplements, by his pupil, Heinrich G. F. C. Haase (q.v.). In one division of this work, that dealing with semasiology, Reisig was a pioneer. Consult J. E. Sandys, *A History of Classical Scholarship*, vol. iii (Cambridge, 1908).

REISINGER, rī′zĭng-ẽr, Hugo (1856–1914). A German-American merchant and art patron. He was born in Wiesbaden, where he was educated at the Royal Gymnasium. Coming to America, he devoted a fortune acquired during a successful mercantile career in New York to the furtherance of art, especially of painting in contemporary Germany and the United States, and to the interchange of artistic ideas between these two countries. The possessor of a large and valuable collection of modern paintings, especially of the German school, Reisinger organized and financed the exhibition of contemporary German art held in the Metropolitan Museum, New York, in 1909, and a similar exhibition of American art held at Berlin and at Munich. In recognition of these services he was made Commander of the Order of the Prussian Crown and of the Bavarian Order of St. Michael; and from Columbia University he received an honorary A.M. in 1910. He bequeathed his entire fortune to the furtherance of his favorite interests, which included the establishment of a chair in the history of art at Columbia University. His collection of paintings was dispersed by sale in 1915.

REISKE, rī′ske, Johann Jakob (1716–74). A German philologist and Oriental scholar. He was born at Zörbig, Prussian Saxony, and was educated at the University of Leipzig, where he devoted much attention to the study of the Semitic languages, especially Arabic. In 1758, after living in abject indigence, he obtained the rectorship of the Nikolai Gymnasium, in Leipzig, and he retained the post till his death. From 1758 he devoted his attention chiefly to Greek literature, in which he became a recognized authority. His works, which are very numerous and are remarkable for their learning, include *Animadversiones in Græcos Auctores* (1757–66) and editions of Theocritus (1765–66); of the Greek orators (1770–75); of Maximus Tyrius (1774–75); of Dionysius of Halicarnassus (1774–77); of Plutarch, with notes and translations (12 vols., 1774–82); Dio Chrysostom (1784–98); and Libanius (1791–94). Reiske was also the first to call attention to the historical and æsthetic value of Arabic literature. His chief work in this field was his Latin translation of the *Annales Moslemici* of Abulfeda (1754; frequently reëdited). Some of these works and his correspondence with Moses Mendelssohn and Lessing were published after his death by his wife, Ernestine Christine Reiske (1735–98). Consult: Morus, *De Vita Reiskii* (Leipzig, 1777); J. J. Reiske, *Selbstbiographie* (ib., 1793); Haupt, *Opuscula* (ib., 1875–76); J. E. Sandys, *A History of Classical Scholarship*, vol. iii (Cambridge, 1908).

REISNER, rēz′nẽr, George Andrew (1867–). An Egyptologist, born at Indianapolis, Ind. In 1889 he graduated from Harvard and in 1891 and 1893 respectively received from that university the degrees of A.M. and Ph.D. During 1895–96 he was an assistant in the department of Egyptology in the Royal Museum, Berlin, then for a year was an instructor in Harvard University, and from 1897 to 1899 served as a member of the International Committee on the Catalogue of the Khedival Museum at Cairo. In 1905 he was appointed assistant professor of Egyptology at Harvard and in 1910 became curator of the Egyptian department in the Museum of Fine Arts, Boston. Intimately connected after 1905 with exploration and excavation in Egypt, Reisner is the author of *Sumerisch-babylonische Hymnen nach Thontafeln griechische Zeit* (1896); *Tempelurkunden aus Telloh* (1901); *Hearst Medical Papyrus* (1905); *The Early Dynastic Cemeteries of Nayu-ed-Der* (part i, 1907); *First Annual Report, Nubian Archæological Survey* (1910); *Models of Ships and Boats* (1913).

REISS, rīs, Wilhelm (1838–1910). A German traveler and naturalist, born at Mannheim. He traveled in the Azores, Madeira, and Canary islands in 1858–60, in Greece in 1866, and with Stübel in 1868–76 explored South America. In particular he visited Ecuador, Colombia, Peru, and Bolivia, and he and Stübel were the first to ascend Mount Cotopaxi. The scientific results of this journey were of much value. Reiss was president of the Berlin Gesellschaft für Erdkunde and of the Anthropological Society. In addition to contributions to the publications of the Gesellschaft für Erdkunde and various scientific journals, he wrote: *Das Totenfeld von Ancon in Peru* (1880–86), with Stübel; *Geologische Studien in der Republik Colombia* (1892–99); *Das Hochgebirge der Republik Ecuador* (1892–1909).

REISSIGER, rīs′sĭg-ẽr, Karl Gottlieb (1798–1859). A German musician, born at Wittenberg. He studied under Schicht at the Thomasschule at Leipzig and dramatic composition under Winter at Munich. He taught at the Berlin Royal Institute, and in 1826 went to The Hague, where he organized a conservatory. This same year he succeeded Marschner as musical director of the German Opera at Dresden, and later was appointed kapellmeister, as Weber's successor. He was a prolific composer in almost every field, but entirely lacked originality.

REITBOK. See Reedbuck.

REITER, rī′tẽr, Virginia (?–). An Italian actress, born at Modena. After studying for the stage under Giovanni Emanuel she made her début at Milan in 1882. She first attracted general attention in *La Figlia di Jefte* in 1886. The next year she visited Mexico, Chile, Peru, and Havana; in 1891 she went again to South America and in 1892 toured Spain. In *Agatomédan* she appeared (1890) at the Teatro Nazionale, Rome. Virginia Reiter played leading rôles in *Othello, I Nozze di Figaro, La Dame aux Camélias,* and *Le Demi-Monde.* In 1893 she formed with Claudio Leigheb the Reiter-Leigheb Company, which presented *Zaza* and other plays. Consult Addison McLeod, *Plays and Players in Modern Italy* (London, 1912).

REJ, rā′y', Mikolaj (or Nicholas Rey) (1505–69). A Polish poet and prose writer, born in the Ukraine. A stout Calvinist, he wrote much in defense of his chosen creed. Rej was one of the first to use Polish as a literary language. He was more than 60 years old before he produced his principal poem, *Zwierciadlo* (The Mirror, 1567; reprinted in 1829). Besides metrical Polish translations of the Psalms (1533), *Postylla Polska* (Gospel Commentaries, 1556), and a catechism, he published a biblical play, *Zywot Józefa* (1545) and several works of satirical and moralizing character. His prose shows the language in its purity before the introduction of foreign words and forms.

RÉJANE, rå′zhän′, Gabrielle (1857–). The stage name of Charlotte Réju, a French actress, born in Paris. She made her début at the Vaudeville in 1875, and soon gained a reputation for her witty impersonations. In 1892 she married M. Porel, then her manager. In 1893 she created her best-known part, the title rôle of *Madame Sans Gêne,* written for her by Sardou. She appeared with it in London in 1894 and in the United States in 1895. Her successes were altogether in the field of emotional acting. In 1905 she founded the Théâtre Réjane in Paris.

REJECTED ADDRESSES. Burlesque poems by James and Horace Smith, published anonymously in 1812. Ostensibly unsuccessful efforts in the competition for the opening of the new Drury Lane Theatre at that time, they were amusing parodies on the poems of Wordsworth, Southey, Coleridge, Byron, Scott, and others.

REJOIN′DER (OF., Fr. *rejoindre,* to rejoin, from Lat. *re-,* back again, anew + *jungere,* to join). In common-law pleading, the answer of a defendant to a plaintiff's replication to his (defendant's) plea. See Pleading.

REJU′VENA′TION, or Rejuvenescence. It is supposed by Maupas and others that the process of conjugation in the Infusoria (q.v.) results in increased vigor and vitality and is thus advantageous to those organisms in which the most primitive form of reproduction is by simple self-division. Indeed it has been observed that conjugation results in increased activity in multiplication by fission. So also sexual reproduction is a rejuvenizing process and tends to prevent both the individual and the species from deteriorating or running out. It may be said to correspond in its effects to cross-fertilization, which is the antidote to too close inbreeding and tends to enhance the vitality of the species and prevent degeneration. In botany, rejuvenation is a term for the transformation of one cell into another, i.e., into a primordial cell, which afterward secretes a new cell wall and forms the starting point of the life of a new individual. See Growth.

REKHTA, rāĸ′tȧ. See Hindustani Language and Literature.

RELAPSE, The; or Virtue in Danger. A comedy by Sir John Vanbrugh, produced in 1697. It was written as a sequel to Cibber's *Love's Last Shift,* and was very popular throughout the eighteenth century. It was imitated by Lee in *A Man of Quality* (1776) and recast by Sheridan as *A Trip to Scarborough* (1777). Voltaire used it as the basis of *Le Comte de Boursoufle* (1734). Later versions were made by Hollingshead in *Man of Quality* (1870) and Buchanan in *Miss Tomboy* (1890).

RELAPSING FEVER (from Lat. *relapsus,* p.p. of *relabi,* to fall back, from *re-,* back again, anew + *labi,* to slip), Famine Fever, or Febris Recurrens. A specific infectious and contagious disease, generally occurring in epidemics and due to a microörganism, the *Spirochæta obermeieri.* This organism is a spirillum, about $\frac{1}{500}$ of an inch in length and undergoing constant movements of a rotary or lashing character. The disease occurs in times of famine and flourishes under conditions of overcrowding, dirt, and poverty. Individuals in constant contact with the disease, as physicians, nurses, and clergymen, are often attacked. The peculiar nature of the malady was pointed out by Henderson in 1842 and by Sir W. Jenner, 1849 to 1851. Their views have since been confirmed by the discovery of the specific microörganism by Obermeier in 1873.

The disease is communicated from one person to another by bloodsucking insects, especially the bedbug, *Cimex lectularius.* African relapsing fever is carried by a tick and is known as tick fever. The specific organism is the *Spirillum duttoni.* The period of incubation of relapsing fever averages from 4 to 10 days. The fever begins suddenly with a chill or rigor, accompanied by frontal headache and pains in the back and limbs. The temperature may be 103° or 104° F., and mounts on the succeeding days to 105° or 106°. The general condition remains much the same for about a week, except that the symptoms increase in severity. Little sleep is obtained, but the mind remains clear. When all the symptoms are at the height, crisis suddenly occurs in five to seven days, with profuse perspiration and a rapid abatement of suffering. Convalescence now sets in and is permanent in many cases. In others the patient feels comparatively well but very weak until about 14 days from the initial attack or 7 days after the crisis, when he is again seized with chills and fever and the whole series of phenomena is repeated. This relapse is usually shorter than the first paroxysm, and permanent recovery follows it in the majority of cases.

The spirilla are present in the blood during the paroxysms and increase in number as the fever progresses. They disappear at the crisis and remain absent until near the advent of the relapse. During this period they may be found in the spleen and bone marrow (as proved by experiments on monkeys), where they probably break down and leave spores which germinate and thus produce the organisms which determine the relapse.

No treatment has succeeded in shortening the paroxysms or preventing the recurrence of a relapse; and although certain drugs, such as quinine, carbolic acid, and iodine, arrest the movements of the spirillum outside the body, they have no influence when given as remedies. Treatment must be symptomatic. Sponging with tepid water or packing in wet sheets will give temporary relief when the fever is very high, and headache may be relieved by cold applications. The disease is rare in the United States.

RELA'TIONS (Lat. *relatio*, relation, reference, report, restoration, from *re-*, back again, anew + *latus*, p.p. assigned to *ferre*, to bear, carry). In the strictest sense, the kindred of a person, i.e., such as are related to him by ties of blood, to the exclusion of connections by marriage. In American law, however, the term is sometimes employed in a wider sense to comprehend all who are entitled under the statutes of distribution to share in the personal estate of a deceased person, including connections by marriage as well as by consanguinity. Consult James Kent, *Commentary on American Law* (14th ed., 4 vols., Chicago, 1896), and Sir William Blackstone, *Commentaries on the Laws of England* (4th Amer. ed., 2 vols., ib., 1899). See AFFINITY; CONSANGUINITY; LINEAL.

RELATIONSHIP. The exact degree of affinity existing between keys, chords, and tones. See TONALITY.

REL'ATIVE, IN LOGIC. See ABSOLUTE.

REL'ATIV'ITY (from Lat. *relativus*, having reference or relation), LAW OF. In its most general form, the law, as given by Stumpf, is that the relation of sensations to one another is essential to their very existence; so that black, e.g., can be sensed only in opposition to white, or at least only in distinction from a grayer or blacker black; a tone or noise only as alternating with other tones or noises or with complete silence, and so on; while every sensation will disappear under the operation of uniform and continuous stimulation. Simple as this statement looks, it is capable of many interpretations, none of which can be regarded as unexceptionable. The grain of truth which Stumpf finds in the doctrine is that the presence of sensation in the adult consciousness is almost without exception connected with certain judgments of its relation to other ideas. And these judgments (apprehensions, apperceptions), if they cannot alter the content of sensation, can at least render it confusable with other contents not now sensed.

Wundt, on the other hand, has consistently maintained that our mental life is governed by a law of relativity, such that every phase of present experience is conditioned not only by other phases of the same experience, but also by the whole past history of consciousness. The laws of mind at large are of two classes, laws of relativity and laws of development. Under the heading of relativity we have (1) the law of psychical resultants, which affirms that every mental complex shows properties which, once given, can be understood from the attributes of its elements, but which cannot be regarded as a mere sum of those attributes. (2) The law of relations asserts that every dissection of a conscious whole into its constituent terms is an act of relating analysis. Finally, (3) the law of psychical contrasts maintains that mental processes of opposed direction mutually reënforce one another. The laws of mental development are (1) the law of mental growth, the application of the law of resultants; (2) the law of heterogony of ends, based upon the laws of resultants and of relations; and (3) the law of development by opposites, which applies the law of contrasts.

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RELATIVITY, THEORY OF. A physical theory first advanced by Einstein in 1905. Its peculiar novelty consists in its radical revision of our ideas of space and time. The scientist distinguishes between absolute and relative concepts. An absolute statement is valid for every one without qualification. Thus, the statement that there are 100 pages in a certain book and similar statements regarding number belong to this class of ideas. A relative concept has meaning only relatively to certain other ideas or conditions, and these must be stated in order to complete the meaning. The notion of position in space is a good example of this class; it is not possible to state where a thing is except with reference to other things. The history of the progress of science has been one of continual shifting of concepts from absolute to relative and vice versa. Thus, to the people of the Middle Ages, believing in a flat earth which was the centre of the universe, "up" was an absolute notion. To-day we regard "up" as a direction which is only defined relatively to a particular observer at a particular time, so that it does not mean the same direction to any two men or to the same man at different times.

Consider now whether velocity is to be considered as an absolute or relative concept. When we say a thing moves we always mean relatively to certain other things which we assume to be at rest. A train moves relatively to the earth, but it is equally true that the earth moves relatively to the train. The earth also moves relatively to the sun, and so on. The set of objects which we regard as at rest in order to describe the motion of others constitute a "system of reference." At first sight it would appear as if motion were necessarily a relative concept, but this is not the case; for there might exist one system of reference characterized by the fact that the laws of nature would appear simpler to observers stationed on it than to those on any other system. This would constitute a unique natural system of reference which could be singled out by any observer in the universe and which would therefore serve to define "absolute velocity." Now, it has long been recognized that the laws of mechanics could furnish no such system; i.e., that these laws would appear the same, say to observers on the earth, as to those on another planet moving with any constant speed in a straight line (uniform motion) relatively to the earth. It was thought to be otherwise with the laws of electricity and magnetism, including those of light, for the luminiferous ether which was supposed to fill all space might furnish such a system. Light being regarded as a wave motion in the ether, a flash of light sent out from any point would travel with uniform speed in all directions relatively to the ether. If, now, the various parts of the ether were at rest with respect to one another so that it could be regarded as a sort of immense stagnant sea filling all space, then motion relatively to the ether would mean the same thing to every observer in the universe and would thus be an absolute concept.

The phenomena of stellar aberration first observed by Bradley in 1728 indicated that there is no relative motion of the parts of the ether between the earth and the stars. The earth travels in a closed orbit around the sun at a speed of about 19 miles a second, and hence at some time of the year must be moving with at least this speed relatively to the ether. Now, if light travels with a definite velocity relatively to the ether, its velocity relatively to the earth would be less if it were overtaking the earth than if it were meeting the earth. The experiment in this form cannot be carried out with sufficient exactness, but equivalent experiments made by different observers failed to show any effect whatever of the earth's motion on electromagnetic phenomena, although the expected effects were of such size that they should have been easily observable. These negative results constitute the fundamental disagreement of facts with existing theories which it is the purpose of Einstein's theory of relativity to explain.

Einstein starts from two assumptions. The first states that if we have a system of reference for which the established laws of physics hold, these same laws would hold for any system moving relatively to it. This in effect denies the possibility of an observer stationed in any one of these systems detecting anything about its motion save its motion relatively to the other systems; it therefore erects into a cardinal principle the negative results of the Michelson-Morley and similar experiments. Einstein's second assumption is that the velocity of light is a constant which is independent of the state of motion of the emitting body—an assumption which we have seen is a consequence of the older theory of the ether, but which in combination with the first leads apparently to hopeless absurdities. For since by the first assumption only the relative motion of the source of light and the observer matters, it follows that the velocity must also be independent of the motion of the observer. Thus, if the observer were moving away from the source with a velocity of 100,000 miles a second, the light, leaving the source with a velocity of 186,000 miles a second, would pass the observer with its full velocity. The velocity of light is thus the same relatively to all observers, whatever their velocity with respect to the source. Einstein seeks the key to this apparent contradiction in a revision of our ideas of space and time.

When the physicist speaks of the time of an event, he has no concern with metaphysical ideas; he means simply a definite number obtained by a definite experiment. He chooses a particular process (the rotation of the earth upon its axis) and a scheme for giving numbers to this process; thus, 4.30 P.M. indicates a certain orientation of the earth with reference to the stars. Any event which is simultaneous with a given position of the earth is said to happen at the time indicated by that position. The rotation of the earth has been chosen to measure time because the laws of nature can be described in simpler terms by the use of this time than by other time-measuring processes. We shall speak hereafter of the standard process, or of an instrument whose indications correspond to it, as a clock. It is important to understand that the physicist deals only with concepts through the experimental processes which define them; so that when he speaks of the properties of time he means properties of the indications of standard clocks, these properties being determined by experiment. Our judgments of time are judgments of simultaneity. How then are we to determine that an event happens, say, at 4.30?

If the event happens at the same place as our clock the problem offers no difficulty. But suppose the place of the event is remote from the clock; to be concrete, how would we find the time of an event on Mars? Note that this requires fresh definition. One way would be to assign the time at which we see it happen. Experiment has shown that in this case the time would depend on our distance from Mars; in fact it was in this way, by observations on the satellites of Jupiter, that Romer discovered that the propagation of light was not instantaneous. To avoid this ambiguity it is necessary to make allowance for the velocity of light, but how is the amount of this allowance to be determined?

Einstein's method is the following: we send a light signal to Mars which is reflected back immediately to the earth; the time of its sending and return are observed, and the time of its arrival on Mars is defined to be halfway between these two; an observer on Mars could thus by noting the time of its arrival set his clock to earth time. Now this process would be valid on the old view of the ether, irrespective of the motion of Mars, provided only the earth were at rest in the ether; for it assumes that the light takes the same time going and coming. On the theory of relativity the process is valid provided the two planets are at rest relatively to one another; so that all clocks belonging to a given system of reference can by this process be made to keep the same time, as seen by observers in the system. Now follows, however, the remarkable consequence that to observers on a different system the clocks on the earth system would not keep the same time. Thus, a Martian event which to observers on the earth happened at 4.30 would to an observer on a planet which was moving with respect to Mars and the earth happen at a different time, perhaps at 4.25. The Martian event would be simultaneous with a different set of earth events according to the system from which it might be observed. This may be summed up by saying that simultaneity becomes a relative concept.

We make no attempt to give the mathematical steps by which the foregoing consequence is deduced. Other results which may also be shown will be briefly enumerated. It can be shown that two similar clocks in different systems will each run slow relatively to the other, the amount of the slowing depending on the relative speed of the two systems. Again, the dimensions of bodies will be shortened along the line of motion, as seen from the second system; masses will be increased, and so on through a long list of physical quantities. All of these, formerly regarded as absolute concepts, become definable only when the relative motion of the observer and the phenomena is given. A notable exception is the quantity of electricity on an electrically charged body; this is still definable absolutely.

If the theory stands the test of future criticism, it will make profound changes in all physical theory. Nevertheless it must not be supposed that the theory makes useless the older conceptions, for the corrections introduced in any actual experiment by the motion of the earth are too small to be observable save in the most refined electrical and optical experiments.

Credit for the actual theory belongs, as has been said, to Einstein; other names should however be mentioned. The work of H. A. Lorentz paved the way, while Minkowski has given the theory a mathematical form which has made its application much easier.

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RELAY′, IN MOTOR VEHICLE. See MOTOR VEHICLE.

RELEASE′. In the most general sense, any act, event, or transaction by which a legal right is discharged. In this sense of the term a right of action based upon a personal tort may be released by the death of the tort-feasor, or a debt released by the discharge in bankruptcy of the debtor, as well as a bond or a right of entry upon land released by the deed of the person claiming the right. We may, perhaps, conveniently distinguish two separate and distinct types of release as still existing, viz., the ordinary release of a debt or obligation and the release of an interest in or claim to land.

The former of these may be effected by act of the parties or by operation of law, as where a contract for personal services is terminated by the death of a party thereto. At common law, however, the forgiveness of a debt, whether complete or partial, is not legally binding if made by parol or simple contract, but requires a release under seal to render it effectual and irrevocable.

The second form of release above referred to is best described as a form of conveyance of real property at common law. Its distinguishing characteristic is the fact that it is in and of itself not available for effecting a conveyance to a stranger, i.e., to one having no interest in the land in question (for which purpose the feoffment or the grant must be resorted to), but only to one in privity of estate, i.e., having an interest with the releasor in the same parcel of land, as a wife of her dower right to the husband's grantee, or a landlord, remainderman, or person asserting any other claim in relation to the premises to a tenant in possession.

In this form of a conveyance of the landlord's estate to his tenant in possession the release played a distinguished part in the history of conveyancing. In the effort to attain a simpler and more private method of conveying freehold estates than the ancient and cumbrous process of livery of seisin, the lease and release were ingeniously combined in a single transaction. Thus, if the land to be sold by A to B was first leased to B for a year, B would by taking possession of the land come into the requisite privity of estate with A to enable the latter to complete the transfer of title by releasing his reversion to B.

Analogous to the first form of release above described, but still operating as a common-law conveyance, is its use to convey doubtful or precarious interests in land or rights in land which do not rise to the dignity of estates, as a contingent remainder to the freeholder who was seised of the land or the right of a disseisee to the disseisor or other person seised of the land.

In form the deed of release is substantially reproduced in the modern quitclaim deed. See CONVEYANCE; DEED; DISSEISIN; ENTRY, RIGHT OF; GRANT; REMAINDER; and consult references there given.

RELI′ANCE. An American racing yacht. See YACHTING.

RELICS (OF., Fr. *relique*, from Lat. *reliquiæ*, remains, from *relinquere*, to leave behind, from *re-*, back again, anew + *linquere*, to leave, Gk. λείπειν, *leipein*, Skt. *ric*, to leave). In ecclesiastical usage, the remains of the bodies of saints; more loosely, objects connected with the earthly life of Christ or of the saints. At an early period miracles are described as connected with relics. Altars were early erected over the tombs of the martyrs, and the present practice of the Roman Catholic church requires the inclusion of some relic or relics within every altar to be consecrated.

The veneration of relics found no important early adversary. One of the treatises of St. Jerome, indeed, is directed against the objections of Vigilantius on this point; but even the Iconoclasts, while vehemently repudiating the use of images, admitted the veneration of relics, and, with the exception of the Waldenses, Wiclif, and some others, it was practically unchallenged until the sixteenth century, when Protestants generally repudiated it entirely as superstitious. The decree of the Council of Trent connects the question with the general one of the veneration to be paid to the saints, and regards the relics of the saints, not as possessing any intrinsic virtue, but as instruments through which God bestows benefits on men. Various relics of Mohammed and other Moslem worthies are preserved at Mecca, Medina, Constantinople, and other places; and relics of the Buddha received the reverence of the Buddhist world. A shrine in Kandy, Ceylon, still claims the possession of a tooth of Buddha. Consult Stephen Beissel, *Die Verehrung der Heiligen und ihrer Reliqueren in Deutschland* (2 vols., Freiburg, 1890–92), and Friedrich Pfister, *Die Reliquienkult in Altertumer* (Leipzig, 1909). See CROSS; HOLY COAT; PILGRIM; SAINT.

RELICT′ PLANTS (OF. *relict*, from Lat. *relictus*, p.p. of *relinquere*, to leave behind). Plants of very restricted distribution, but formerly more widespread. For example, the big trees of California are the remnants of a former widely distributed group. The term may also be applied locally to species which belong to a former topographic condition when they were abundant.

RELIEF (Lat. *relevamentum*). An incident of the feudal tenure of lands. It consisted in the obligation of the heir to redeem the land from the lord of whom it was held, in order to make good his right of inheritance. Unlike the more burdensome incidents of wardship and marriage, it attached not only to lands held by knight's service, but was levied equally on the heir of socage lands. Originally of indefinite amount and depending largely on the arbitrary will of the lord, it was at an early period fixed and regulated by statute. Of all the incidents of feudal tenure it had the longest life, not only surviving the gradual disappearance of military tenures, but being expressly saved in the Statute of 12 Charles II (1660), which abolished tenure in chivalry and relieved all tenures of their more burdensome incidents. The right of relief was never expressly abrogated, but it has fallen into desuetude in England, and there is no evidence that it was ever exercised in the United States. See FEUDAL TENURE; INCIDENT.

RELIEF SCULPTURE. That form of sculpture in which the objects represented project from the surface or background. In the fine arts the term "relief" is used to signify any projection of figures from the surface; it is so used in painting for the apparent projection of forms and masses from the background, in architecture for projection of decoration, and in a similar manner in ceramics, goldsmith's work, etc. The term is, however, mostly employed in reference to sculpture. Relief sculpture differs from sculpture in the round in that it is attached to the background, from which the latter stands free, being visible from all sides. It is not always possible, however, to distinguish the boundaries between these two chief classes of sculpture. See SCULPTURE.

The two principal varieties of relief sculpture are: high relief, usually known by the Italian name *alto-rilievo* (q.v.), in which the objects project strongly from the background; and low relief (It. *basso-rilievo;* Fr. *bas-relief*), a surface ornamentation in which the projection is very slight. Midway between the two is semi-relief (It. *mezzo-rilievo;* Fr. *demi-relief*), in which the figures are fully rounded, but without detached portions. *Stiacciato* (It., crushed, flattened) is the slightest form of relief, being little more than scratchings upon the surface, while in the hollow relief (*cavo-rilievo*) (q.v.) the contours of the figures are carved below the surface of the background. In nearly all relief work figures and background are of the same material, though there are some examples to the contrary in best Greek art and in Chinese and Japanese decorative work. The materials generally used in larger relief work are marble, bronze, and sometimes terra cotta, and in smaller decorative work the precious metals and stones, enamel, ivory, wood, etc., are more common. Reliefs were almost universally colored by the Egyptians, in classical antiquity, and often in early Christian art. This practice prevailed in wood, terra-cotta, and stucco work during the Gothic and Renaissance periods, while marble and stone were not usually colored.

History. Relief is that form of sculpture which most resembles painting, with which it has composition and perspective in common. In the history of relief work, therefore, the practice has swayed between purely plastic and pictorial principles. Relief was practiced contemporaneously with sculpture in the round by the early culture peoples, like the Babylonians, Assyrians, and Hittites. The Egyptians made a very wide use of hollow relief. The Greeks conceived relief in a purely plastic sense and achieved the highest mastery of it. Distinguishing strictly between high and low relief, they used the former between the triglyphs and in the tympana of the temples, but the latter in friezes, gravestones, and the like. Purely decorative principles were strictly followed, the space being adequately filled, the background never carved, and the heads of the figures at the same height. (See GREEK ART.) During the Hellenistic period a more picturesque and dramatic composition was practiced, and subjects were carved in the backgrounds—a practice which in Roman times degenerated into the use of several different planes of reliefs. Picturesque relief attained its most perfect development at Florence during the Renaissance, in such works as the baptistery doors of Ghiberti and the marble pulpit of Santa Croce by Benedetto da Majano. In these works all the qualities of painting except color were reproduced. Donatello, Luca della Robbia, and other sculptors of the Renaissance followed plastic laws more strictly, but during the entire baroque period picturesque principles prevailed to such an extent as to preclude any real style of relief. At the beginning of the nineteenth century Thorvaldsen, inspired by the study of Attic grave monuments, brought back relief to its proper plastic function. Since that time excellent relief work has been frequent, in Europe as well as in America. The present tendency, however, is to neglect the distinction between high and low relief and to give rather undue emphasis to pictorial qualities. For bibliography, see SCULPTURE.

RELIEF SYNOD. See PRESBYTERIANISM.

RELIG'IO MED'ICI (Lat., A Physician's Religion). A prose work by Sir Thomas Browne (1643), the devout musing of a scholar and man of science.

RELIGION (Lat. *religio,* probably from *religare,* to bind fast, from *re-*, back again, anew + *ligare,* to bind), COMPARATIVE. The science which treats of religions from an historical and comparative point of view. Its methods are first descriptive, then historical, and finally comparative. The descriptive part of comparative religion discusses the actual phenomena presented by religion, and includes treatments of individual religions. Even in such an individual discussion the comparative method must be employed if the phenomena presented by the religion in question are to be correctly interpreted. The historical aspect considers the development of a single faith from its origin or from its earliest ascertainable manifestation. The historical side of comparative religion, therefore, is evolutionary in character. The comparative side seeks to discover the laws of religious evolution working in all religion. The final object of the science is to investigate the nature and development of religious beliefs and to discover if possible the origin of religion itself. Comparative religion therefore ranks as one of the historical sciences.

Many definitions of religion have been given, varying according to the factors of religion which have been emphasized. A fundamental distinction may be made between definitions in terms of object and in terms of experience. The first class defines religion as an attitude of conduct and life directed towards a power without. In this class of definitions a god, or some power which takes his place, is regarded as an essential to religion. The greater number of definitions fall under this class. Such are: the natural belief in a power or powers beyond our control and upon whom we feel ourselves dependent (Jastrow); the worship of higher powers from a sense of need (Menzies). It is possible, however, to consider the essence of religion as experience without regard to the object towards which it is directed. By these definitions a god is not necessary for a religion. The most famous definition of this class is that of Schleiermacher: religion is a sense of infinite dependence. This is inadequate, because it makes religion merely a feeling. A common definition of this class is: religion is that to which a man attaches supreme value; that which he would rather die than give up. Early religion, however, can hardly be said to have been so lofty a moral structure. In recent years the emphasis of the social element, especially in early religion, has led to a new group of social definitions, of which an example is: religion in its first form is a reflection of the most important group interests through social forms and ceremonies based upon the activities incident to such interests (Ames).

The classifications of religion have been even more various than the definitions. The division of religions into true and false and into monotheistic and polytheistic belong to prescientific days. The present tendency is to classify religions according to the stage of culture which they represent and, among the religions of civilized races, according to whether the religion makes its appeal to single races or to all men. This gives a division into primitive or tribal, national, and individual or universal religions, the last two being the religions of more or less advanced cultures.

It is impossible to recover the origins of religion. The present lower races do not represent early man in all respects. While the first religion must have been like the religions of present races of primitive culture in those particulars which express a simple and somewhat childlike idea of life and its relations, yet comparative religion does not claim to be able to produce an exact picture of the earliest religion. It is content to begin the study of religion with the most primitive races now existing.

Primitive races, with all their differences in detail, present essentially the same characters in all parts of the world. One of the things which they have in common is religion, and since the mental qualities of all primitive races are much the same, their religions are also much the same. They rest on animism, which is the assumption that all objects possess life and so are like man. This universal assumption ascribes conscious life to the sun and moon, to animals, trees, rocks, springs and rivers, mountains, winds, the rainbow, anything which attracts attention. If these objects are supposed to affect the life of man in any way, then there is the desire to gain their friendship and favor, which soon grows into an attitude that is worship. Whether primitive religion always regards the powers to be conciliated as animated and personal is debated. There seems to be evidence that they are sometimes regarded merely as powers undifferentiated and unpersonified. The Melanesian word *mana* and the Australian *churinga* are terms which represent powers respected and feared but seemingly not personified. Two classes of objects possessing power are found in all primitive religions—nature objects and spirits. The nature objects may be great, like the sun or sky, or lesser, like the trees and rocks. The former allow of worship anywhere, and so put no hindrance on the migration of the tribes of their worshipers. The latter originate local worships and tend to bind their worshipers to a single locality.

Spirits may be spirits of localities or spirits of the dead, especially of ancestors. The belief in spirits seems to arise from the fact that in dreams the dreamer seems to be able to leave the body and to meet other people, even those who are dead. Obviously, then, there must be life apart from the body. These nature objects and spirits are not necessarily gods, but they are the stuff from which gods are made. Gods are superhuman powers, in definite control of some department of nature or of human life, to whom men must appeal for some needed good. The method of approach to the gods was at first simple and needed no priest. All knew the rites, and the head of the household performed them. The origin of the priest, like that of the carpenter, was due to the social convenience of the division of labor. Even before the priest came the inspired man, who because of certain experiences was believed to be in personal communion with the gods. He is the central Asian shaman, the medicine man of the American Indians, the early Semitic prophet. Magic and totemism (qq.v.) are found in connection with primitive religion. While their origin and relation to religion are subjects of much discussion, it is certain that they are in essence not religious. The chief characteristic of primitive religion is the fact that it is a tribal matter. The god cares only for the tribe, and he who leaves the tribe leaves the god. Sacrifice and other worship are tribal, and the god had no relation to individuals apart from the tribe.

The next stage of religion is the national. When by conquest or assimilation the tribe becomes a nation, a correlative change takes place in the religion. The gods become greater and better, since they must do justice to more people. But they are also more remote, as the king is more remote from his people than the tribal chief. Worship grows in splendor. This is the period when great temples and magnificent rituals are natural. The orders of priesthood obtain greater power. The religion becomes centralized. Taboos grow in strength. Nothing pertaining to the god must be treated as common. Gifts and sacrifices become more costly. The stately and solemn worship furnishes a basis for an emotional religion, but its natural expression is not in the wild orgies frequent in tribal religion. The gods are still, however, national gods, and their care and favor are limited to the nation. All members of the nation are worshipers of the national gods, not, however, as individuals, but because they are members of the nation. Excellent examples of national religion are the Phœnician and the Babylonian religions and the religion of

Israel before the rise of Hebrew prophecy. The individual or universal religions arise out of the national by the breakdown of nationalism, as when the Hebrews were forced into the exile; by the emphasis on the universality of an order of the world, as in Confucianism and Taoism; or by the rise of men of ethical or philosophical insight, like the Hebrew prophets, Buddha, the Hindu philosophers, Zoroaster, and Mohammed. This type of religion is no longer limited to any particular place or race. The god is regarded as standing in relation to all men. All individuals are seen to stand in relation to one cause of life, one moral law. This makes a tendency to monotheism in religion and a unitary view of the world in philosophy. It is expressed by the one God of the Hebrews and the Christian religion, the one Tao or order of the world of the religions of China, the one Supreme of Vedantism. Logically such a religion ought to be a missionary religion. Ritual and priesthood should disappear, except as they may be used to assist the individual in realizing his privilege of immediate relation to the Supreme Power. The highest ideal of the religion is perfect harmony of will between that Power and man. Society becomes perfect when the harmony is world-wide. The ideal remains the same whether the Power be considered, as in Christianity and Islam, a personal God, or, as in Confucianism and Buddhism, an order of the world, or, as in Hindu philosophy, a central soul of the universe. These religions always contain survivals of the earlier stages through which they have passed. Sometimes they are definitely mingled, as Judaism, which contained elements of the old national religion embedded in a body of prophetic universalism. Occasionally they even start as universal religions and end with national limitations, as did Zoroastrianism. Three of the religions have so far emancipated themselves from national limits and spread to various races that they are especially known as the universal religions—Buddhism, Islam, and Christianity. Religion has no further stage, for this stage includes the whole race of men. There is no wider field into which it can expand.

Religion, like other phases of human activity, exhibits more variation as it rises in culture. Comparative religion is largely occupied with the study of the great religions, in which the religious aspirations of great civilizations have found expression. The science is concerned with their characteristics, with the changes which they have undergone and the reasons therefor, with their successes and failures, in order to find, if possible, the laws which govern the evolution of religion.

The study of comparative religion is of modern origin. It is indeed true that we find in the histories of Herodotus, in the *De Iside et Osiride* of Plutarch, in the *De Dea Syria*, generally ascribed to Lucian, in the *Germania* of Tacitus, and in brief mention in numerous other classical authors accounts of religions other than Greek or Roman. Yet here the historic knowledge was too slight to render the philosophical part of the work anything but superficial, although the descriptive part is still of value. It is noteworthy that the first real impulse to an historical study of religions came with the sixteenth and seventeenth centuries. To this early period belong such books as the *Pansebeia, or View of all Religions of the World,* by Alexander Ross (London, 1653; 4th ed., enlarged, 1672), and the *Ceremonies and Religious Customs of the World,* by Picart and Bernard (ib., 1733). This latter work is in a sense the forerunner of the historical method of religious study, and is far superior to one of its most important successors, the *Origine de tous les cultes, ou religion universelle,* by C. F. Dupuis (Paris, 1795; new ed., 10 vols., ib., 1835–36). The real founder of the historical school, however, was J. G. von Herder, who outlined the history of religion, so far as it was then possible, in his *Ideen zur Philosophie der Geschichte der Menschheit,* published at Leipzig in 1784, although his previous writings indicate that many of his ideas on this subject had been formulated much earlier. The year after Herder's *Ideen* saw the publication of C. Meiners's *Grundriss der Geschichte aller Religionen,* followed 21 years later by his *Allgemeine kritische Geschichte der Religionen.* In the decade 1821–31 the foundations of a scientific philosophy of religion were laid by G. W. F. Hegel in his *Vorlesungen über die Philosophie der Religion* (not published, however, until 1832). The credit of inaugurating the study of comparative religion in a truly scientific spirit and method, however, must be given to Max Müller, even though his views are now in great part rejected in the light of later investigations. In a long series of volumes, including *Lectures on the Science of Religion* (London, 1872), *Physical Religion* (ib., 1890), *Anthropological Religion* (ib., 1891), *Natural Religion* (2d ed., ib., 1892), and *Theosophy or Psychological Religion* (2d ed., ib., 1899), he developed his system. He also aided in the establishment of the Hibbert lectures on the origin and growth of religion in 1878, and above all founded in 1879 the epoch-making series of translations entitled *The Sacred Books of the East* (50 vols., London, 1879–1910). A still greater name than Max Müller's is that of C. P. Tiele, of Leyden, whose *Outlines of the History of Religion* (translated from his Dutch *Hoofdtrekken der Godsdienstwetenschap* into English by J. E. Carpenter, London, 1877; new ed., New York, 1905; 3d Ger. ed. by Weber and Söderblom, Breslau, 1903) were at the time of publication the best general survey of religions from an historical and descriptive point of view, while his *Elements of the Science of Religion* (Edinburgh, 1897–99) and his *Geschiedenis van den Godsdienst in de oudheit tot op Alexander den Groote* (Amsterdam, 1891–97) are no less authoritative. In France the study of comparative religion received a powerful impetus in the establishment in 1888 of the Musée Guimet. In America there is a rapidly growing interest in this science, both in academic and in more general circles. See also BUDDHISM; CHINA, *Religion;* CONFUCIUS; DEMONOLOGY; DRUID; EGYPT, *Religion;* FETISHISM; GHOSTS; GREEK RELIGION; INDIA, *Religion;* JAINISM; MAGIC; MEXICAN ARCHÆOLOGY; MOHAMMEDANISM; MYTHOLOGY; NATURE WORSHIP; PERSIAN MYTHOLOGY; PERUVIAN ARCHÆOLOGY; PHALLICISM; PRIEST; ROMAN RELIGION; SACRIFICE; SCANDINAVIAN AND TEUTONIC MYTHOLOGY; SHAMANISM; SHINTO; SUPERSTITION; SWASTIKA; TABOO; TAOISM; TOTEMISM; ZOROASTRIANISM.

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RELIGIOUS AND MORAL EDUCATION IN SCHOOLS. See Schools.

RELIGIOUS EVOLUTION. See Evolution.

RELIGIOUS LIBERTY. See Liberty, Religious.

RELIGIOUS ORDERS. See Monasticism; Orders.

RELIGIOUS SOCIETIES. In the legal sense corporations formed for the advancement of religion or the administration of church property for religious purposes. To the efforts of religious corporations in the Middle Ages to acquire vast holdings of land was due the enactment of the various English statutes of mortmain (q.v.) which at first restricted the power of such corporations to acquire lands and later absolutely prohibited the conveyance of lands to them by any subject of the crown. Most of the States of the United States now have general laws governing the formation of religious corporations and defining their powers. Generally there is no limit to their power of acquiring land for church purposes, and all their property used directly for church or religious purposes is exempt from taxation. See Canon Law; Corporation; and cf. Civil Church Law; Club.

RELIGIOUS SOCIETY OF FRIENDS. See Friends.

RELIGIOUS TRACT SOCIETY. See Tract Societies.

REL'IQUARY (ML. *reliquare, reliquarium*, from Lat. *reliquiæ*, remains). A receptacle for preserving sacred relics. Reliquaries may be of any material; the finest are of ivory or of silver, enamel, gold, or crystal, ornamented with costly jewels. Shrines are large reliquaries permanently fixed in place. Reliquaries are among the most consummate masterpieces of mediæval minor art, especially metal work. Particularly famous are such mediæval reliquaries as those of San Marco at Venice and of the cathedrals of Aix-la-Chapelle and Cologne. The reliquary in the form of a church in the cathedral of Orvieto is one of the most wonderful pieces of thirteenth-century goldsmith work, with exquisite details. The Romanesque and Gothic periods (eleventh to fifteenth centuries) were the golden age of such work. At first the Rhenish and Flemish schools were easily preeminent, but in the thirteenth century Italy and France surpassed the northern schools. Reliquaries were of many shapes. They often took the form of the relic they contained, such as a hand, a foot, or a head. They were nearly always decorated with minute figures in relief or even statuettes, or with colored enamels and ornamental designs. The Renaissance produced fewer masterpieces; the finest is the shrine of St. Dominic in San Domenico at Bologna.

RELIQUES (rē̇-lēks′) **OF ANCIENT ENGLISH POETRY.** A collection of old ballads and lyrics (1765), taken by Thomas Percy from an old manuscript of the early seventeenth century, which he found at a friend's house in

Shiffnal, Shropshire. Ritson charged Percy with forged and garbled versions of many ballads, and even questioned the existence of the manuscript. Its existence, however, was proved by an edition from the original in 1868 by Hales and Furnivall.

REMAIN′DER (OF. *remaindre*, remain, from Lat. *remanere*, to remain, from *re-*, back + *manere*, to stay). In the English and American law of real property, a future estate dependent upon a precedent estate less than a fee simple and created by the same deed or act of conveyance by which the lesser estate is created. The fee tail, the life estate, and the term of years are conceived of as being estates less in quantity than a fee simple, and the gift of such a lesser estate leaves something—some part of the fee simple—undisposed of, which may remain, or revert back, to the grantor (in which case it is called a reversion), or may be given by the same deed which creates the lesser estate to a third person as a remainder. There may be any number of remainders, one after the other, until the entire fee simple has been disposed of, as, e.g., after a present, or particular, estate to A for life, remainder to B for life, remainder to C for life, remainder to D in fee tail, leaving still a fee simple to be given to E as a final remainder or to come back to the grantor as a reversion. A remainder thus given to an ascertained person, ready to go into effect upon the determination of the precedent estate, is said to be vested. If given to an unborn or unascertained person, or upon a further contingency (as, when B shall return from abroad), it is a contingent remainder. Such a remainder was at common law scarcely of sufficient importance to be regarded as an estate at all. It was incapable of alienation to a stranger and was liable to be extinguished by the accidental or deliberate determination of the precedent estate before the contingency had happened on which the remainder was to vest. But modern legislation has given the contingent remainder much of the definiteness and permanence of the vested remainder by freeing it from this dependence upon the precedent estate.

Though classified as a future estate, a remainder is conceived of as a present interest and as capable of being dealt with as such by the owner thereof. It may thus be alienated like any other property (though, being incorporeal, it has always required a deed of grant to convey it), and, being real property, it will, if a remainder in fee, descend to the heirs of the owner. Although efforts have been made in some of the United States to wipe out by legislation the distinction between remainders and other future estates, these have not completely succeeded, and the distinction is still of fundamental importance in America as well as in England. See ESTATE; FUTURE ESTATE; PROPERTY.

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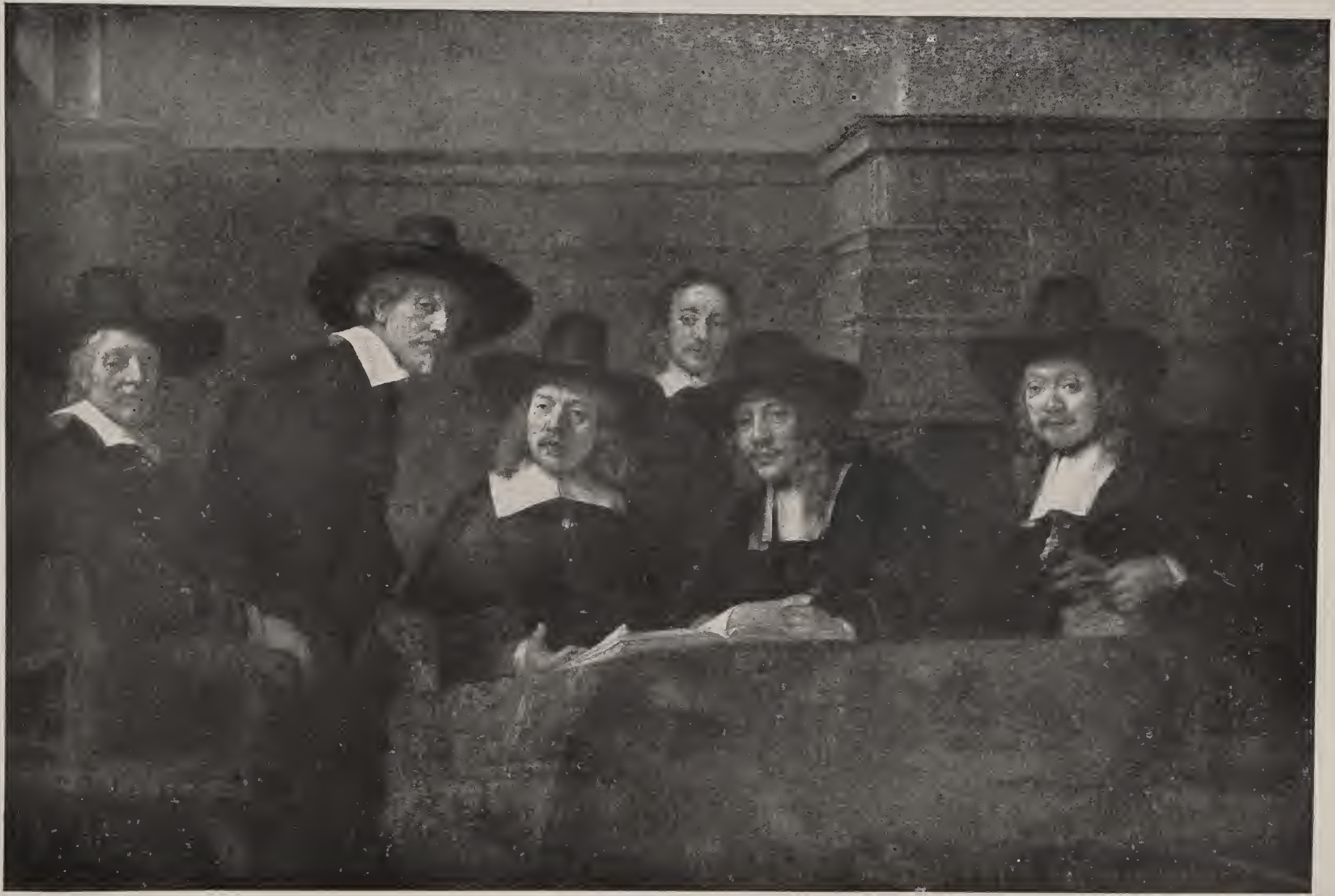
REMAINDER THEOREM. An algebraic principle of great service in factoring. The theorem may be stated thus: If $f(x)$ is a rational integral algebraic function of x, then the remainder arising from dividing $f(x)$ by $x - a$ is $f(a)$. Since the dividend equals the product of the quotient and the divisor, plus the remainder, we have $f(x) = q(x - a) + r$, and if $x = a$, the equation becomes $f(a) = r$. Similarly the remainder arising from dividing $f(x)$ by $x + a$ is $f(-a)$. When the remainder is zero the division is exact, hence the divisor is a factor of the given function. For example, $x^n + y^n$ is divisible by $x + y$ when n is odd, since the remainder $(-y^n + y^n) = 0$. The rational binomial factors of functions above the second degree are readily determined by use of the remainder theorem and synthetic division. For example, to factor $a^3 - 6a^2 + 11a - 6$, it is only necessary to substitute for a factors of the absolute term -6. Using detached coefficients (see COEFFICIENT), the division by $a - 1$ may be performed thus:

$$\begin{array}{r}1 - 6 + 11 - 6\\ 1 - 5 \quad 6\\ \hline 1 - 5 + 6; \quad 0\end{array}$$

Whencc the factors are $(a - 1)\,(a^2 - 5a + 6)$ or $(a - 1)\,(a - 2)\,(a - 3)$.

REMAK, rā′mȧk, ROBERT (1815–65). A German physiologist and embryologist, born at Posen. He studied at Berlin (M.D., 1838), where he became privatdocent in 1847 and professor extraordinary in 1859. Besides important work on the physiology of the nerves, he, with Kölliker, further elaborated the germ-layer theory. He was the discoverer of the axis cylinder of the nonmedullated nerve fibres (Remak's fibres), of the ganglia of nerve cells in the wall of the venous sinus of the frog's heart (Remak's ganglion); he demonstrated that cells divide to form tissues; and he was one of the first to use the galvanic in place of the induced current. His chief embryological work was *Untersuchungen über die Entwicklung der Wirbeltiere* (1851, 1855).

REMBRANDT, rĕm′brȧnt, in full REMBRANDT HARMENSZ VAN RIJN, här′mĕns vän rīn (1606–69). A Dutch painter and etcher, the greatest master of the school. The date of his birth is disputed, the most probable conclusion being that he was born at Leyden, July 15, 1606. His father, Harmen Geritsz van Rijn, a well-to-do miller, sent him to a Latin school, preparatory to the university, but finally permitted him to follow his inclinations for painting. After studying with his relative, Jacob van Swanenburgh, at Leyden, he was for six months a pupil of Pieter Lastmann at Amsterdam, from whom he learned the technique of etching; but he was little influenced by either of his teachers. He was a very precocious genius, and upon his return to Leyden he soon acquired a high reputation. About 1631 he removed to Amsterdam, where he speedily became the most fashionable portrait painter and had many pupils. Among his patrons were Frederick William, the Prince of Orange, and Burgomaster Jan Six; the foremost men of the day, like the poet Jeremiah Decker and Constantin Huygens, were his friends and associates. He bought a grand house in the Breedstraat, which he equipped in a marvelous manner as a studio and which contained his remarkable art collection, especially rich in old Netherlandish prints.



REMBRANDT

"THE SYNDICS OF THE DRAPERS," FROM THE PAINTING IN THE RIJKS MUSEUM, AMSTERDAM

A very important event in Rembrandt's life was his marriage in 1634 with Saskia van Uylenburgh, daughter of a burgomaster of Friesland, who brought him a handsome dowry. Their happy union was the inspiration of many of his best works. After her death in 1642 he withdrew even more from the world, especially after his financial misfortunes, which censorious biographers have ascribed to dissipation and extravagance, but which was rather due to his ignorance of money matters, his generosity, a financial panic of the day, and to the change in public taste. In 1657 his creditors sold his wonderful collection, including several of his own paintings, for the pitiful sum of 5000 florins, and in 1658 his house for 11,000. But Titus, Saskia's son, and Hendrickje Stoffels, a young woman who had become his housekeeper in 1649, formed a partnership for the disposal of Rembrandt's pictures and rented a small house in the Rozengracht, paying the artist a stated yearly salary. After 10 years of toil the old artist satisfied his creditors. The stories of his dissipation and low associates in later life are unfounded. His chief associates were artists and he was interested in the picturesque inhabitants of the Ghetto; but he also had more influential friends, like Jan Six. Hendrickje died in 1664, leaving a daughter Cornelia, and Titus in 1668. Rembrandt himself died poor and forgotten, and was buried in the Westerkerk, Amsterdam, on Oct. 8, 1669.

His art reflects in a unique manner the sentiments and emotions of his eventful life. More than any other he depicts the inner life and is the painter of the soul. A masterly technician when he so desired, he is more often the dreamer, the painter of things unseen. This he achieved by an unequaled mastery of light and shadow, which forms the chief technical characteristic of his works and lends to them the deep poetic charm which makes them so attractive. He is preëminently the poet painter. His early pictures are painted with somewhat detailed execution and light color, but he increasingly uses a broader brush and richer color in harmonies of gold and brown. Later in life his painting becomes highly impasto, almost decorative in character. He exercised great influence upon the art of his day, and during the nineteenth century was the model and inspiration of many German and Dutch painters. Among his many pupils were Gerard Dou, Govaert Flinck, and Ferdinand Bol.

Rembrandt was preëminent in portraiture, and no artist has succeeded better in rendering the head in a realistic, characteristic, and at the same time in a picturesque manner. Among his numerous portraits, some of the most interesting are those of himself and of his family. Of the former, which are the most numerous, the best-known youthful examples are in the Pitti Gallery (Florence) and at Budapest. In middle life there are fine examples in Dresden, Munich, the National Gallery (London), the Louvre, and elsewhere, and in old age the grand examples in the Frick collection, New York, in Vienna, in London, and in the Louvre. The best portraits of Saskia are at Dresden and Cassel, and a beautiful portrait of both is the so-called "Wedding Breakfast" at Dresden. The finest likeness of Hendrickje is at Berlin; of Rembrandt's mother, at Vienna; of his son Titus, in the Metropolitan Museum, New York, at Vienna, and elsewhere. Among other famous portraits are: a "Money Changer" (1627, Berlin); the "Naval Architect and his Wife" (1630, Buckingham Palace); "Polish Nobleman" (1631, St. Petersburg); the poet Krul (1633, Cassel); the "Mennonite Preacher Aanslow Consoling a Woman" (Berlin Museum); the so-called "Frame Maker" (1640, Havemeyer collection, New York); the "Lady with a Fan" (1641, Buckingham Palace); Elizabeth Bas (1642, Amsterdam); "Jan Six" (1654, Six collection, Amsterdam); the so-called "Jewish Bride" (Amsterdam); and the "Architect" (1656, Cassel). Of his "Rabbis" examples are in Buckingham Palace and (his best) in St. Petersburg. Of his numerous "Old Women" the best known are in London and St. Petersburg.

Rembrandt's most ambitious efforts in portraiture were groups similar in character to those of Hals. The masterpiece of his earlier full-light treatment is the well-known "Anatomy Lecture" (1632, The Hague). It represents the anatomist Nicholas Tulp, who ordered the picture, making a post-mortem examination before a group of his associates. The heads are wonderfully expressive, and the dead body is treated in a manner at once realistic and delicate. On a still larger scale is his masterpiece of the second period, formerly in the town hall and now in the Rijks-Museum. It is not, however, a "Night Watch," by which title it is generally known, but a portion of the civic guard issuing forth in broad daylight. His third masterpiece, "De Stallmeesters" (1662), "The Syndics" of the Clothiers' Guild, in the same museum, unites all the excellences of his style in the more sombre coloring of his last period.

Rembrandt's religious subjects, depicted in the picturesque Oriental costumes of the Ghetto, are characterized by high dramatic power and by deep religious feeling of that homely kind typical of the Dutch Calvinistic church. Among the principal examples are the "Simeon in the Temple" (1631, The Hague); the "Descent from the Cross" (1633, Munich); the "Samson" series at Berlin, Dresden, and elsewhere; the "Angel Leaving Tobias" (1637, Louvre); "Reconciliation of David and Absalom" (1642, St. Petersburg); "The Pilgrims at Emmaus" (1648, Louvre); "Jacob Blessing his Grandsons" (1656, Cassel); "David and Saul" (The Hague); "Return of the Prodigal Son" (St. Petersburg). His mythological pictures make no endeavor to attain classic form or beauty, but strive for purely pictorial effects, some of them, like the "Rape of Ganymede" (Dresden), even burlesquing the subjects. Well-known examples are "Diana and Endymion" (Liechtenstein Gallery, Vienna); the "Rape of Proserpina" (Berlin); "Danaë" (St. Petersburg). The landscapes which Rembrandt painted display the same poetic feeling and technical skill as his figure subjects; he is a consummate master of atmospheric effects under light and shadow. The best-known example is "The Mill," in the Widener collection, Philadelphia; others are at Brunswick, Cassel, Dublin, etc. Equally skillful and important are his few representations of still life, of which the best-known example is the "Carcass of Beef" (Louvre and Johnson collection, Philadelphia). Rembrandt is richly represented in the United States, both in public and in private collections. The Metropolitan Museum, New York, possesses 18 examples, acquired mostly with the Altman collection and including the celebrated "Old Woman Cutting her Nails," "Lady with a Pink," "The Auctioneer," the "Old Woman in an Armchair," and several portraits, among them one of the artist and Hendrickje Stoffels. In the Art Institute, Chicago, is the well-known "Girl at a Window," and there are portraits in the New York Historical Society and the Toledo Art Institute. Among the many examples in private possession are: 10 in the Widener collection, Philadelphia; "Nicholas Ruts" and the portrait of a young artist in the J. P. Morgan collection; "The Standard Bearer" (George J. Gould, New York); "The Noble Slav" (W. K. Vanderbilt, New York); "The Gilder," Herman Doomer, and others (Havemeyer collection, New York); and portraits in the Frick collection, New York.

Rembrandt was probably the most consummate etcher of all times, and held his rank on purely technical as well as artistic grounds. Among his best-known prints are the "Descent from the Cross" (1637); "Christ Healing the Sick"; "Christ Preaching"; "Burgomaster Jan Six"; and the well-known "Landscape with Three Trees." Examples of his prints, as well as of his admirable drawings, may be found in the Louvre, Albertina (Vienna), and British Museum, in the museums of Berlin, Dresden, Munich, Holland, and in many private collections. A great exhibition of Rembrandt's works was held in Amsterdam in 1906 to commemorate the three hundredth anniversary of the painter's birth.

Bibliography. The principal authority on Rembrandt is Wilhelm Bode, whose *Œuvre de Rembrandt* (8 vols., Paris, 1897) contains reproductions of all Rembrandt's paintings; with Valentiner he wrote an interesting life of the painter (Berlin, 1909). Consult also: A. A. P. C. Blanc, *L'Œuvre complet de Rembrandt, décrit et commenté* (2 vols., Paris, 1859–61); Carel Vosmaer, *Rembrandt: sa vie et ses œuvres* (2d ed., ib., 1877); *Masters in Art*, vol. i (Boston, 1900); Malcolm Bell, *Rembrandt van Rijn*, in "Great Masters in Painting and Sculpture" (London, 1901); John La Farge, in *Great Masters* (New York, 1903); P. G. Hamerton, *Etchings of Rembrandt* (London, 1904); F. E. Michel, *Rembrandt Harmensz van Rijn: A Memorial of his Tercentenary* (New York, 1907); Adolf Rosenberg, in *Klassiker der Kunst* (Stuttgart, 1907); Kenyon Cox, in *Painters and Sculptors* (New York, 1907); T. L. Hare, *Three Great Portrait Painters* (ib., 1909); C. J. Holmes, *Notes on the Art of Rembrandt* (London, 1911). For the historic sources of Rembrandt's life, consult C. Hofstede de Groot, *Die Urkunden über Rembrandt* (The Hague, 1906). The best and most scholarly work on Rembrandt's etchings is by Rovinski (3 vols., St. Petersburg, 1890).

REMEDIOS, rā̇-mā'dē̇-ō̇s, or San Juan de los Remedios. A town in the Province of Santa Clara, Cuba. It is situated 30 miles northeast of Santa Clara and 5 miles from the port of Caibarién, with which it is connected by rail, as it is with all the important towns of the island (Map: Cuba, F 4). Pop., 1899, 6633; 1907, 6988.

REMEDY (from Lat. *remedium*, cure, from *re-*, back again, anew + *mederi*, Av. *mad*, to heal). In law, the means by which the violation or invasion of a legal right is either prevented, redressed, or compensated. The term in fact is the correlative of the term "legal right," there being in general no right without a corresponding remedy for its violation. The term "remedy," however, does not include punishment, and therefore has no application in the criminal law.

The various forms of remedy afforded by the law may be classified as: (1) remedy by act of the injured party, or self-help; (2) remedy by operation of law; (3) remedy by action or suit.

1. Remedy by the act of the injured party includes all those rights conferred by law on private persons to protect themselves or their property from injury, and in certain cases to redress wrongs done, without recourse to legal proceedings. In general, remedy by act of the party, or self-help, is permitted by law whenever the remedy afforded by action would be less effective and when the privilege thus accorded to the individual to take the law into his own hands is not inconsistent with sound public policy. Thus, in general, one may defend his person and property from unlawful attacks provided he use no more force than is necessary to accomplish that result. (See Self-Defense.) One who has been unlawfully deprived of his property may upon fresh pursuit forcibly retake the property, but if the pursuit is not made immediately following the wrongful taking, or if the property has passed into the hands of an innocent holder, his only remedy is by action to recover the property or damages for its conversion. Other forms of remedy by act of the injured party are distress, right of entry, and abatement of a nuisance.

2. There is perhaps but a single true example of remedy by operation of law, and that is the ancient doctrine of remitter, which is of slight importance in modern practice.

3. Remedy by action is the relief or redress afforded to one whose legal right has been invaded, by means of a legal proceeding carried on in a court having jurisdiction over the subject of the suit and the parties to it. See Action; Procedure.

For the varied forms of remedies, see Chancery; Common Law; Distress; Equity; Forcible Entry and Detainer; Nuisance; etc., and consult the authorities there given.

REMEDY OF LOVE, The. 1. A poem of the sixteenth century, wrongly ascribed to Chaucer and printed in the edition of 1532. 2. A paraphrase of Ovid's *Remedy of Love* by Sir Thomas Overbury, printed in 1620.

REM'ENSNY'DER, Junius Benjamin (1843–). An American Lutheran (General Synod) clergyman, born at Staunton, Va. He graduated at Pennsylvania College, Gettysburg, in 1861 and at Gettysburg Theological Seminary in 1865. After pastorates in Philadelphia and in Savannah, Ga., he removed in 1880 to New York, where he became minister of St. James's Lutheran Church. Dr. Remensnyder, who did much to unite the Lutheran sects, was elected president of the General Synod in 1911. His writings include: *Doom Eternal* (1880); *Luther* (1883); *Six Days of Creation* (1886); *Lutheran Manual* (1892); *The Atonement and Modern Thought* (1905); *Mysticism* (1908); *The Post-Apostolic Age and Current Religious Problems* (1909); *The Problem of Life* (1913).

REMÉNYI, rĕ'mān-yē̇, Eduard (1830–98). An Hungarian violin virtuoso. He was born at Heves and studied the violin under Joseph Böhm at the Vienna Conservatory, 1842–45. He took part in the insurrection against Austria in 1848 and fled from Hungary. He came to the United States in 1849, but in 1853 went to Weimar, and thence to England, where he was appointed solo violinist to Queen Victoria. In 1860 he was pardoned by the Austrian government and returned to Hungary. He afterward traveled all over the world. As a technician he was equaled by few, and had his style been free from certain idiosyncrasies and exaggerations he might have won a place among the world's greatest violinists. Consult Kelly and Upton, *Edouard Reményi* (Chicago, 1906).

RE'MI. A powerful people of Belgic Gaul, allied with Cæsar in his campaign of 57 B.C. Their capital became the modern Rheims (q.v.). Consult Cæsar, *De Bello Gallico*, book ii.

REMI, REMIGIUS, Saint. See Remy.

REM'INGTON, Frederic (1861–1909). An American illustrator, painter, and author. He was born at Canton, N. Y., studied at the Yale Art School and at the Art Students' League, New York, but was mainly self-taught. After working in a store he went to the West and became a cow-puncher on a ranch, absorbing the spirit of the life around him, which he faithfully recorded on his return to New York, first in illustrations for Western tales, then in paintings and sculpture. Whatever his medium, he was preeminently an illustrator—original, dashing, sincere, and vehemently realistic. Among the paintings of this "pioneer in distinctive American art" are "Cavalry Charge on the Southern Plains" (Metropolitan Museum, New York) and "The Emigrants." His bronzes include the statuette groups "Broncho Buster" and "Wounded Bunkie" (Metropolitan Museum). He was an associate National Academician and author and illustrator of *Pony Tracks* (1895), *Crooked Trails* (1898), *The Way of an Indian* (1906), and other tales.

REMINGTON, Joseph Price (1847–). An American pharmacologist, born in Philadelphia and a graduate (1866) of the Philadelphia College of Pharmacy, in which he became professor of pharmacy (1874), director of the laboratory (1877), and dean (1893). He was a member of the commission on revision of the *United States Pharmacopœia* for 1880, 1890, 1900, and 1910, being elected chairman in 1901. In 1893 he served as president of the first International Pharmaceutical Congress, held in Chicago. Untiring in his efforts to elevate his profession, Remington did much to establish a standard for drugs and chemicals. His best-known work is *Practice of Pharmacy* (1886; 5th ed., 1907). With others he edited the *United States Dispensatory* (1885; 19th revision, 1909).

REMINGTON, Philo (1816–89). An American manufacturer and inventor, born at Litchfield, N. Y. He studied at the Cazenovia Seminary and then entered his father's arms factory at Ilion, N. Y. During the Civil War the Remingtons supplied small arms to the Federal government, and at its close they formed a corporation under the title E. Remington and Sons. Soon afterward they began to manufacture the breech-loading rifle named after them. In 1873 the firm secured the right to one of the first typewriters, but subsequently the manufacture both of typewriters and of rifles came under the control of large stock companies, the name Remington being retained.

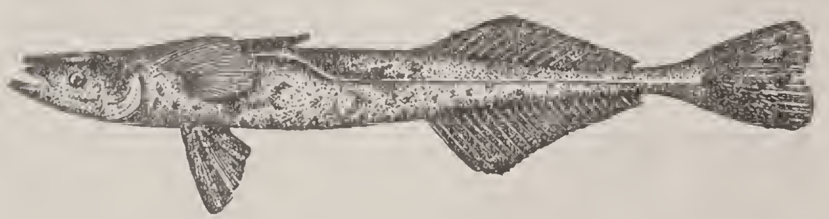
REMIREMONT, re-mĕr'môɴ'. A town in the Department of Vosges, France, on the left bank of the Moselle (Map: France, N., M 5). The residence building of the old abbey has been rebuilt and is now used as the hôtel de ville. There is a trade in Vosges cheese. Cotton goods, embroideries, and ironware are manufactured. Pop., 1901, 10,322; 1911, 10,548.

REMITTENT FEVER (from Lat. *remittens*, pres. p. of *remittere*, to send back, from *re-*, back again, anew + *mittere*, to send). A severe form of malarial fever characterized by a regular lowering of the temperature, which, however, always remains above the normal point. In this respect it differs from intermittent malaria, in which there is an interval of entire absence of fever (apyrexia), and from the continuous variety, in which the body heat remains continuously elevated. The severer forms of remittent fever prevail in the Southern States and in tropical countries. They are found in southern Asia, western Africa, Central America, and the West Indies. A milder type of remittent fever is seen in temperate climates, especially in the late summer and fall. The treatment of remittent fever is the same as that of other forms of malarial fever. Quinine in proportional doses according to severity acts as a specific. Tonics must also be given and attention paid to the general health. See Intermittent Fever; Malaria.

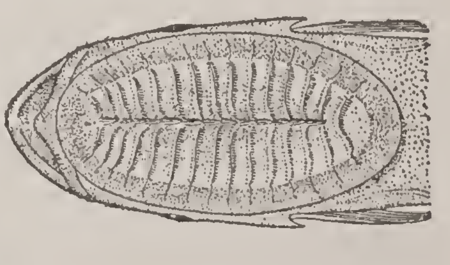
REMMIUS PALÆMON, Quintus. See Palæmon, Q. R.

REMONSTRANTS. See Arminianism.

REM'ORA (Neo-Lat., from Lat. *remora*, delay, from *re-*, back again, anew + *mora*, delay), or Sucking Fish. A fish of the family Echeneididæ, interesting because of its commensal habits. The remoras attach themselves to sharks and other large fishes by a sucking disk on the top of the head. They have an elongated body, covered with very small scales; one soft-rayed dorsal fin, situated above the anal fin; the head flattened and covered with an elongated disk extending back beyond it, which exhibits numerous transverse cartilaginous laminæ directed backward and has a free flexible broad margin. These laminæ are formed by modification of the spinous processes of a first dorsal fin, and when they are raised, after the margin of the disk has been closely applied to a smooth surface, a vacuum is created; and so powerful is this apparatus that great weights may be dragged by a remora, while it obstinately refuses to let go its hold. A remora thus attached to a shark or turtle may be carried about for weeks, leaving its host only to secure food, injuring the shark in no way save, perhaps, by the slight check its presence gives to the shark's speed in swimming. In Madagascar native turtle catchers put a ring about the narrow caudal end of the remora's body, attach a line to this ring, and thus use the fish for catching turtles. Several species of the family are known, dwelling in all the warmer seas. They are mostly small fishes, 1 or 2 feet in length, and of plain colors or striped lengthwise in brown and white. One (*Remora brachyptera*) is occasionally caught as far north as Cape Cod. A rarer form is *Rhombochirus os-*



WEST INDIAN REMORA (*Rhombochirus osteochir*).



SUCKING DISK OF A REMORA.

teochir, which attaches itself to spearfishes (*Tetrapturus*). More numerous is the closely related species called shark sucker (*Echeneis naucrates*). (See Shark Sucker.) Consult Jordan and Evermann, *Fishes of North and Middle America* (Washington, 1898).

REMPHAN, rĕm′făn. A word which occurs in Acts vii. 43 in a passage quoted from the Greek text of Amos v. 26. In Amos the reading is Chiun, which is evidently intended either as the name of a heathen deity or as a symbol of idolatrous worship and is generally explained as the Babylonian name of the planet Saturn. See Chiun.

REMSCHEID, rĕm′shīt. A city in the Rhine Province, Prussia, 19 miles northeast of Cologne (Map: Germany, B 3). It has several fine technical schools. Remscheid's manufactures are mainly small steel and iron wares (tools, scythes, skates, etc.), in which industry it ranks first in Germany. There are also machine shops, rolling mills, and manufactures of silk ribbons. Remscheid is first mentioned in 1132. Its industries were stimulated by Protestant refugees from Holland and France. Pop., 1900, 58,108; 1910, 72,176.

REMSEN, rĕm′sen, Ira (1846–). An American chemist and educator, born in New York City. He graduated from the College of the City of New York in 1865, from the College of Physicians and Surgeons, New York, in 1867, and received the degree of Ph.D. at Göttingen in 1870. From 1870 to 1872 he was assistant in chemistry at the universities of Tübingen, Munich, and Göttingen, and from 1872 to 1876 professor of chemistry and physics in Williams College. At Johns Hopkins he served as professor of chemistry (1876–1913), director of the chemistry laboratory (1876–1908), and president of the university (1901–12). Dr. Remsen carried out a number of important investigations in both inorganic and organic chemistry. Among his contributions to this science the best known is his discovery of saccharin (q.v.). The *American Chemical Journal*, which he founded in 1879 and edited, was subsequently merged with the *Journal of the American Chemical Society.* Dr. Remsen served as president of the American Association for the Advancement of Science (1902), the American Chemical Society (1902), the Society of Chemical Industry (1910–11), and the National Academy of Sciences (1907–13). In addition he was honored by scientific bodies abroad. His writings include: *Principles of Theoretical Chemistry* (1876); *Introduction to the Study of the Compounds of Carbon, or Organic Chemistry* (1885); *Introduction to the Study of Chemistry* (1887); *Elements of Chemistry* (1888); *Inorganic Chemistry* (1889); *A Laboratory Manual* (1889); *Chemical Experiments* (1895). Most of these passed through numerous editions and were republished in England. In 1915 appeared *The University Movement.*

RE′MUS. The brother of Romulus (q.v.) and founder with him of Rome.

REMUS, Uncle. A character introduced by Joel Chandler Harris (q.v.) in *Uncle Remus, his Songs and his Sayings* (1880), and in other stories. He is an old plantation darky, who entertains the son of his mistress with quaint stories of the doings of Brer Fox, Brer Rabbit, and other animals.

RÉMUSAT, rå′mụ′zȧ′, Charles François Marie, Count de (1797–1875). A French politician and philosophic historian, born March 14, 1797, in Paris. He was the son of Claire Elisabeth Jeanne Rémusat (q.v.). Rémusat studied with brilliant success, and in 1818 began his career as a journalist and supporter of Guizot. He contributed constantly to *Le Globe* from its establishment in 1824. From 1830 to 1848 he was deputy, and for brief periods Undersecretary of State (1836) and Minister of the Interior (1840). After the revolution of February, 1848, he was elected to the Constituent and Legislative Assemblies, and became an opponent of Louis Napoleon, by whom he was exiled after the coup d'état. He was amnestied in 1859 and devoted himself to literature and science. From 1871 to 1873 he was Minister of Foreign Affairs. The most noteworthy of his writings are: *Essais de philosophie* (1842); *Abélard* (1845); *Passé et présent* (1847); *L'Angleterre au XVIII siècle* (1856); *Bacon* (1858); *Hartley* (1874); *Histoire de la philosophie en Angleterre depuis Bacon jusqu'à Locke* (1875). After his death were published six volumes of *Correspondance pendant les premières années de la Restauration* (1883–90).

RÉMUSAT, Claire Elisabeth Jeanne Gravier de Vergennes, Countess de (1780–1821). A writer of memoirs, born in Paris. She was a grandniece of Vergennes, Prime Minister under Louis XVI, a noted beauty of the court of Napoleon I, and an intimate friend of Josephine. As wife of Count Augustin Laurent de Rémusat, chamberlain of Napoleon, and as *dame de palais,* she was acquainted with the intimate life of the Napoleonic court, of which she left an account in her *Mémoires* published in 1879. She was also the author of an *Essai sur l'éducation des femmes* (1824).

RÉMUSAT, Jean Pierre Abel (1788–1832). A French Orientalist, born in Paris, the son of a surgeon. His father taught him Latin, which he wrote and spoke with great ease. He took up Chinese and unaided brought out in 1811 his *Essai sur la langue et la littérature chinoises.* He received his degree as a physician at 25 and served in the military hospitals. A chair of Chinese having been established at the Collège de France in 1814, Rémusat was appointed to it. He was made a member of the Academy in 1816 and in 1818 succeeded Visconti as editor of the *Journal des Savants.* He was one of the principal founders of the Société Asiatique of Paris in 1822 and was long its secretary. He translated and wrote a good deal, many of his shorter productions appearing in the *Moniteur* and other periodicals, as well as in the *Journal* of the Asiatic Society. He died of cholera in Paris. His principal works are: *Livre des récompenses et des peines* (the Chinese *Kanying-pien*), with notes and illustrations (Paris, 1816); *L'Invariable milieu* of Tsz'-tse (1817); *Description du royaume de Camboge* (1819); *Histoire de la ville de Khotan,* to which is appended a treatise in which he endeavors to show that jade is the jasper of the ancients (1820); *Eléments de la grammaire chinoise* (1822); *Mémoire sur la vie et les opinions de Lao-tse* (1823); *Mélanges asiatiques* (1825); *Iu-Kiao-li* (The Two Cousins) (1826); *Recherches sur les langues tartares* (1829); *Nouveaux mélanges asiatiques* (1829); *Foĕ Kouĕ Ki, ou relations des royaumes bouddiques* (a translation of the travels of the Buddhist pilgrim Fa-hien, unfinished at the time of his death, but revised, completed, and supplemented by Klaproth and Landresse and brought out in 1836). Consult Silvestre de Sacy, *Notice sur la vie et les ouvrages de Rémusat* (Paris, 1834).

REMY, rā′mĭ, Alfred (1870–). An American philologist and writer on music. He was born at Elberfeld, Germany, but early came to the United States, where he graduated from the College of the City of New York (1890) and from Columbia (A.M., 1905). He studied the theory of music and piano under B. O. Klein in 1890–96, and was musical critic of *Vogue* (1895–97), musical editor of the *Looker-On* (1895–97), professor in the International Conservatory, New York (1895–97), and lecturer in the New York College of Music (1896–98). He also taught languages in several schools, and after 1906 was an extension lecturer for Columbia. For the second edition of the New International Encyclopædia he had charge of the department of music. His publications include *Alarcón's Novelas Cortas Escogidas* (1905) and *Spanish Prose Composition* (1908).

RÉMY, rȧ′mē̇′, Daniel de. See Courcelle, Sieur de.

REMY, r*e*-mē̇′, **REMI**, or **REMIGIUS**, rē̇-mĭj′ĭ-ŭs, Saint. 1. Apostle of the Franks (437–c.533). He was born of noble family at León. He was appointed in 459, against his will, to the bishopric of Rheims, and his episcopate is memorable for the conversion of Clovis, who was baptized by Remy on Dec. 24, 496. Remy lived to see Gaul almost entirely Christianized, and died in 532 or 533. Some of his letters are preserved in Migne, *Patrologia Latina*, lxv, as also two documents under the title of *Testamenta*, the genuineness of which has been disputed. His day is October 1. Consult his *Life*, by Aubert (Paris, 1849), D'Avenay (Lille, 1896), and Carlier (Tours, 1896). 2. An Archbishop of Lyons (853–875), who sided with Gottschalk (q.v.) and whose works are in Migne, *Patrologia Latina*, cxxi. 3. A Benedictine monk, head of the episcopal school at Rheims (882–908), whose works, which are commentaries and an allegorical interpretation of the mass, are in Migne, *Patrologia Latina*, cxxxi.

RENAISSANCE, rĕn′ĕ-säɴs′ *or* rē̇-nā′s*a*ns; *Fr. pron.* r*e*-nȧ′säɴs′ (Fr., new birth, from Lat. *renascens*, pres. p. of *renasci*, to be born again), or Revival of Learning. A name usually applied to the transition from mediæval to modern methods of study and thought, the mediæval method being that of subjection to authority, to absolutism in church and state, which were one, to the end that, through obedience to the powers external to himself but representing God, man might be saved. The scholastic discipline of this period had sharpened men's critical sense, and political events in which the representatives of the Church were involved clamored for criticism. An awakening historical sense, stimulated by the influx on western Europe, both before and after the capture of Constantinople in 1453 by the Turks, of Eastern scholars with their somewhat different culture and of manuscripts, began to weigh the claims of universal monarchy and indivisible Christendom. Meanwhile the European mind, which had lain under the spell of the philosophy of realism, with its indifference to the phenomena of everyday experience and its contempt for the individual as compared with the authority of traditional institutions, encountered a new philosophy, that of nominalism, which had found expression in the Englishman William of Occam in the first half of the fourteenth century and later became a vital force in the political theories of Marsiglio of Padua. The essence of this new way of looking at things is the importance of the individual, his right to think and organize as may seem best to him. Hence new theories of church and state, as expressions of the newly dignified individual, became permissible. In religious affairs we see the application of this principle in the fearless criticism of the prevailing conditions by Wiclif in England, Huss in Bohemia, and all their sympathizers, organized or not, throughout Europe. This central idea is that the most important fact of Christianity is the membership of the individual Christian in a community of which Christ alone is the head, consequently organized forms of human authority in religion are nonessential and may be totally wrong. The only necessary authority is that of Scripture, and the inevitable result of this is the right of individual interpretation with all its consequences. From Wiclif on through the whole period of the Reformation the Bible is the common source of appeal for the most diverse forms of opposition to the Roman system.

Parallel with this development in religion is the intellectual process we call the revival of learning. Wiclif's Italian contemporary, Petrarca, subjected to a sweeping criticism all the existing forms of the science of his day: the scholastic philosophy, the science of astrology, the study of the law and of medicine, the practice of teaching. To this mass of tradition Petrarca opposed the principle of individual study and observation. Yet he too, like the religious reformers, must have his authority, and he found it in the classic literature. The ancients stood to him for types of a higher manhood, with larger, freer, and truer conceptions of life. They seemed to him free from the superstitious slavery to traditions which he saw around him. His own struggling individualism found its justification in what he imagined to be the perfected individualism of the ancient world. His own poetic gift found its chief satisfaction in the poetic charm of ancient literature; even the prose of Cicero seemed to him to have a wonderful rhythm long before he could understand it. Then, precisely as the religious reformers insisted that the Bible should be studied without restraint of doctrine or tradition and made use of the printing press to offer it, in vernacular translations, to the people, so Petrarca found his chief mission in collecting, collating, copying, and publishing the texts of the classical authors. Still further, as the translations of Wiclif and others were made, not from the original tongues, but from the imperfect Latin authorized version (Vulgate), so Petrarca had to be content with Latin versions of the Greek authors. In both cases the authority they reverenced came to men in an imperfect form, but in both the spirit of a new time is perfectly evident. Wiclif is the first apostle of the Protestant Reformation, and Petrarca is the first great teacher of the revival of learning.

Petrarca, a champion of scientific method, was also, after Dante, the chief creator of the modern Italian language. The literary use of the modern tongues, the natural utterance of the free layman, is, equally with the more sympathetic study of the ancient world, an element in the great reaction against a purely clerical and Latinized culture. This double intellectual life of Petrarca is shared by all his humanistic contemporaries and immediate followers. Giovanni Boccaccio is known to posterity chiefly through his Italian prose tales, but his own special pride was in the service he rendered to classical learning by his laborious encyclopædic works—the *Genealogy of the Gods,* a dictionary of mythology, and his *Dictionary of Classical Geography.* These books served as a groundwork of classical studies for the youth of two centuries to come. Boccaccio died as professor of the *Divine Comedy* at the University of Florence, another illustration of the equality of the modern and ancient literatures in the estimation of Renaissance Italy.

Petrarca applied to learning for the first time what we have learned to call the collector's instinct. Much of the classic literature was already known, but until Petrarca no one had thought of searching for more. Through his widely extended personal relations in all the countries of Europe he was able to employ willing hands to bring the long-forgotten manuscripts out of their hiding places, to have them sent to him, procure copies of them, compare these with the originals, and thus learn wherein they needed correction. Many indications in already known writings pointed to others not yet discovered and thus made possible intelligent search after these lost treasures. All this work was carried on by Petrarca and his contemporaries with the fresh enthusiasm that belongs only to an interest freed from any professional quality, but it soon became the serious pursuit of men who gave their lives to it and thus laid the foundations for a new profession, unknown to the Middle Ages, the profession of the scholar, pure and simple. These men were devoted to learning for its own sake and ready to leave to others its application to practical things.

The same passion of discovery appears also in the field of archæology. The Middle Ages had pitilessly despoiled the remains of ancient buildings to gain material for their own constructions and had destroyed without scruple the choicest works of antique sculpture. Now, following the indications of what remained above ground, Petrarca and his followers began to seek for what was hidden. They gave the first feeble impulse to the vast activities of modern research. To them we owe the beginnings of both the libraries and the museums of modern Europe.

In the generation following Petrarca the influence of the New Learning makes itself widely felt in many forms of activity. Men whose early training had been chiefly as scholars came to be sought for services of every kind. Coluccio Salutato, one of Petrarca's most ardent admirers and imitators, spent his life as secretary of the Republic of Florence, at a time when the little state was involved in the most complicated relations with all the powers of Europe. It was his duty to write the elaborate Latin essays which were then the chief medium of diplomacy, and his fame rests upon the elegance and purity of this imitated classicism. Poggio Bracciolini filled for life a similar place in the papal chancery, and was no less approved and applauded because his caustic humor reveled in ribald obscenities. Niccolò Niccoli was the business centre of the Florentine group of scholars, the earliest type of the modern book collector and publisher. Ambrogio Traversari, general of the Order of Camaldoli, devoted much time to studying and editing the works of the ancients. Francesco Filelfo was the earliest specimen of the haughty pedant, learned beyond others in all the detail of scholarship but without the creative power that had marked the pioneers. He touched the schoolmasterly stage of the revival when the work of discovery had largely been done and when the chief distinction of the scholar was to be gained by a kind of technical skill quite independent of any largeness of mental equipment.

It is at this stage that we begin to see the results of the great expansion of interest due to the study of Greek. Petrarca had deeply felt the importance of this study and had bemoaned his incapacity to engage in it. Greek was still a living tongue in parts of southern Italy, and communication with the East was frequent enough, but Boccaccio, who seems really to have made the effort, found it impossible to procure suitable instruction. The men of the next generation, however, set themselves more earnestly to work; Greek teachers began to hear of the golden opportunities in the rich Italian towns, and Italian youths sought instruction at the ancient school of Athens. The earliest and most influential of these Greek teachers was Manuel Chrysoloras (died 1415), a man of distinction in the public service at Constantinople, brought over to Italy by his duties in this capacity and then employed as teacher of Greek at Florence. Another Greek of later influence was John Argyropulos (died c.1489), who was successively rector of Padua and professor at Florence and finally at Rome. Of Italians who illustrated the highest application of ancient culture to the development both of Italian literature and the perfection of classic learning, we may mention Guarino (died 1460), the teacher of Lionello d' Este, Poliziano (died 1494), who instructed Pietro de' Medici, and Lorenzo de' Medici (died 1492).

Circumstances favored a rapid spread of the new culture. The Italian cities, grown rich under democracy, but somewhat tired of its responsibilities, had been passing into the control of that extraordinary series of despotic rulers who united with a brutal unscrupulousness of character a taste for the best in literature and art without a parallel. It was one of the chief claims to power for a new-made tyrant like Cosimo de' Medici that he provided the means of existence for talent of every sort. Even the bloody ruffians who one after another held power in Milan made places for scholars and artists, maintained libraries, and encouraged learned research. The ancient universities of Bologna, Padua, and Salerno were reinvigorated by the healthful breath of the New Learning and stimulated by the rivalry of the new schools founded by the younger republics. The papacy, with a free hand after the Council of Basel (1431–49), passed into the control of a series of men like Nicholas V, Pius II, and Leo X, in whom the interest in learning and art was an absorbing passion. Under these favoring conditions a certain flippancy of character came to be associated with the cleverness of the fifteenth-century scholars. Without formally renouncing their allegiance to Christianity, many felt the desire to reproduce in themselves the content of mind of their beloved Greek philosophers and were as openly antagonistic as was politic to the usurper Christianity. While paganism had by no means disappeared during the Middle Ages, its survivals and outbreaks had been either unconscious or accompanied by a sense of guilt. But now paganism found itself about to be reinstated as of more ancient right and therefore nobler birth than its rival. It is at this point that the counter-reformation strikes at both the Reformation in the North and the Church's enemies near at home. The Council of Trent assembles in 1545 and Dolet is burned in Paris in 1546. Bartholomew, Smithfield, autos-da-fé, Alva's treatment of the Netherlands, the burning of Bruno in Rome, are so many attempts to crush the rebirth of man's spiritual independence, which had manifested itself most clearly in the reformulation of religious belief; its political expression, checked in Italy by the act of Charles V in placing the peninsula under a Spanish hegemony, was destined to be suppressed by the hostile forces of church and state for over two centuries. It is in art, therefore, that the Renaissance can be said to have had its first and most complete expression, in art nourished by the treasures of antiquity rediscovered and revalued by the humanists. The wonders of the cinquecento are most numerous in Italy, but France had her Rabelais, Spain her Cervantes, and England her Shakespeare.

A change came over the spirit of the New Learning when it passed to the more serious, less artistic, and more deeply religious peoples of the North. The impulse which led young Germans and especially young Englishmen to cross the Alps and study the ancient classics under Italian teachers was largely the desire to find the very best means to acquire such training as would help them in the professions. There is in the North little of the affected æstheticism of the later Italians. Such men as those whom Erasmus found in England at the end of the fifteenth century—John Colet, later dean of St. Paul's, founder of the most important boys' school in England and interpreter of Christianity by the method of a rational criticism; Grocyn, the most important agent in introducing the teaching of Greek into England; Thomas Linacre, founder of the London College of Physicians; and Thomas More, a busy lawyer, king's counselor, and social reformer—suggest a type of man totally different from the members of the Florentine Academy. Yet all these men drew their intellectual inspiration from Italy and were free to acknowledge their debt. Erasmus himself, with all his biting satire and his ready criticism of many serious things, was primarily the preacher of a sane rationalism based upon sound learning, and by this he always meant the learning of the New Method. One of the services of the northern humanism was the revival of the study of Hebrew on a scientific basis. What we have said of the mediæval study of Latin applies equally to that of Hebrew. It had been pursued by Jewish scholars with a view to the perpetuation of their racial institutions, but it had not been in any sense an instrument of culture. Johann Reuchlin, an elder contemporary of Luther and Erasmus, was the first to call attention to the importance of Hebrew in a complete scheme of Christian scholarship. He aroused a storm of opposition from the same obscurantist elements that had always been ready to persecute Jews as inevitably hostile to all that bore the Christian name. He found his support wholly in the circle of enlightenment that had spread itself outward from the study of the Greek and Latin classics as a means of civilization. The best expression of this incident in the struggle is found in the *Epistolæ Obscurorum Virorum* (q.v.) (Letters of the Men of Darkness), a galling satire of the Reformation period, in which the old scholastic method was held up to derision.

The first quarter of the sixteenth century saw the capture of most of the great universities of the North by the new spirit. At Paris the Sorbonne still defended the ancient faith by the ancient methods, but the Collège de France, founded by Francis I, became a seat of enlightened instruction. At Louvain, one of the most solid bulwarks of the scholastic theology, a new school was established with the help of Erasmus.

That the New Learning had its effect on the Protestant Reformation is further shown by the studies of Luther, Calvin, Zwingli, and other leaders of the movement.

The Renaissance may be defined as a period of increased activity of men's powers, due to the breaking down of those forces which had kept them in leash. This activity displayed itself most characteristically in the revival of learning, which gave the Reformation its tools. See HUMANISM.

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RENAISSANCE ARCHITECTURE. See RENAISSANCE ART, *Architecture*.

RENAISSANCE ART. In the last decades of the fourteenth century and the first decades of the fifteenth a new spirit invaded art, asserting itself in a new enthusiasm for the study of man and the study of the antique. To the humanists in literature corresponded the realists, naturalists, and classicists in art. Antique art was rediscovered, but while the classical element preponderated in architecture and decoration, the element of realism was, until the advent of the High Renaissance, more important in sculpture and dominated painting. The flowering of the Renaissance into these new impulses was chiefly due to a few leading artists of Tuscany between 1390 and 1430, to the architect Brunelleschi, the sculptors Donatello, Quercia, and Ghiberti, and the painters Masolino, Masaccio, and others. Northern critics, however, have shown that a strongly realistic school had previously developed in Burgundy, northern France, and Flanders, especially in the sculpture of such artists as Claux Sluter, Beauneveu, and Jean de Cambrai. The age of the Renaissance, though it practically closes before 1600, was not superseded by a Græco-classical revival until the period immediately preceding the French Revolution.

Painting was the typical art of the Renaissance, because it best expressed its realism. In architecture the style was far less original, its character being less constructive than decorative. The preponderance of the secular spirit led to a decadence of religious art in all forms. The previous tendency towards general types in art gave way before a new individualistic tendency, each artist creating his own personal style. In architecture to a considerable extent, but more decidedly in painting, the peculiarities of local schools became very prominent.

Tuscany was followed by Lombardy in the development of the Renaissance about 1460, and shortly afterward by Venice. Rome and Naples were simply meeting places for Tuscan and Lombard artists. France was the first foreign country to follow the example of Italy, with whom its relations of all kinds had long been of the closest. Spain, in some parts, then followed quite early in the sixteenth century. Not till the middle of the century did Germany and England accept the new style to any large extent, and even then with less of pure beauty and less appreciation of the classic spirit than in Italy and France.

Renaissance sculpture and painting are of such importance in the history of the general development of these arts that it is most convenient to treat them under the general articles.

Architecture. *Italy.*—Gothic architecture had never acquired a deep-rooted hold in Italy and Italian architects had been seeking for a new style ever since the decline of the Romanesque. The inspiration for this they found in a study of the Roman ruins, whose details supplied them with suggestions for new forms of architectural expression in which, as in most Italian work of all periods, the decorative idea predominated over the structural. The style thus developed was more successful in secular than in religious buildings. Coming at a time of individualism, it developed personal and local phases of style, and its history is the history of the works of individuals, not of a national style. Several periods of Italian Renaissance can be distinguished: (1) early or free Renaissance, c.1420–1500; (2) high or classic Renaissance, c.1500–1580; (3) the decline or baroque, c.1580–1780. The founder of the style was the Florentine Brunelleschi, the greatest designer of the early Renaissance and equaled only by Michelangelo and Bramante among later men. In the Pazzi Chapel (1425) and the two great basilican churches of Santo Spirito and San Lorenzo he revived the moldings and details of classic architecture, but neither he nor his followers, Michelozzi and Giuliano da Majano, attempted any close imitation of Roman buildings. The two great palaces of this first period in Florence, viz., the Riccardi by Michelozzi (1430) and the Pitti (1435), though Roman in scale and in minor details, were of a thoroughly modern and Florentine type. Alberti was the first to adapt strictly Roman forms to both religious and secular architecture by the use of superposed orders, pilasters, entablatures, and Roman arches. Florentine architects of later date, Rossellino and Francesco di Giorgio, carried the new style to Pienza, Siena, and Cortona, and others, like the Majani, Laurana, and Giuliano da Sangallo, to Naples, Urbino, and Rome. The ducal palace at Urbino is one of the most imposing masterpieces of the early Renaissance. In Lombardy the new style developed a prolific school of design in brick and terra cotta, more varied and picturesque than the Florentine. Its influence was carried to Venice by the Lombards, and there gave rise to the most richly decorative of all the local Renaissance styles, through the free use of marble incrustations and surface carving. To Lombardy belongs also the most highly decorated façade of the Renaissance, that of the Certosa at Pavia (1470); and from Lombardy came Bramante (q.v.), the genius who inaugurated the Middle Renaissance, after his establishment in Rome in 1499.

While most of his predecessors had been primarily goldsmiths or decorators, Bramante was a master builder and became an architect in the true modern sense. He was the first to embody the genuine Roman spirit in modern design, as in his Tempietto and in his designs for the Vatican and St. Peter's (1503–06). Henceforth both the Lombard and early Tuscan systems of ornament were abandoned for a more severe and grandiose treatment; only in the interiors was decoration still abundant. The design that embodied its best features was Bramante's plan for St. Peter's. The Roman school under him now succeeded the Tuscan in the leadership, and the study of Vitruvius and the measuring and drawing of Roman ruins became an accepted part of every architect's training. Raphael, Peruzzi, and Antonio da San Gallo were among Bramante's foremost pupils; the Farnesina, Massimi, and Farnese palaces embody their ideas, the last named being the most imposing in Rome. But meanwhile the Venetian school had not lost the individual charm (see VENICE) of its civic and palace architecture under Guglielmo Bergamasco and his rivals and then under the neoclassic leader Sansovino, whose Libreria di San Marco and Palazzo Cornaro (1528–32) marked an epoch in Venetian architecture.

This middle period closes with Michelangelo, whose genius, like Bramante's, also ushered in a new period, that of the scientifically developed Renaissance, based upon the deepest study of classical monuments. Remodeled by Michelangelo, St. Peter's remained even more the type for Renaissance churches. The dome, either single or grouped, the tunnel vault and cross vault, often coffered, continued the orthodox forms of covering. Internal piers became heavier, while columns often took the place of pilasters outside. The single order after the colossal example of it given at St. Peter's by Michelangelo reigned supreme. Vignola's works present this style under a more refined aspect and mark the beginning of the villa architecture of the Roman school. (See LANTE, VILLA.) In the palaces of Alessi and others at Genoa monumental staircases and vestibules are the central point for grandiose and original treatment, rather than the façades. The progressive domination of classic formulæ is observed alike in the writings and the buildings (especially at Vicenza) of Palladio (1518–80). The term Palladian is generally used for this scientific-theoretical style, whose side lights were Vignola, Serlio, and Scamozzi. Its first great embodiment in Palladio's work was the arcade around the basilica at Vicenza, which was followed by other remarkable works, such as the Palazzo Chieregati, the Palazzo Tiene, and the Teatro Olimpico. He created his highest types of religious architecture in Venice with San Giorgio Maggiore and the Redentore, and through them produced a revolution.

Hard on his footsteps came the baroque style (see BAROCCO) (c.1575–1780). It was a reaction from Palladian severity and reveled in broken lines, vagaries of proportions, and defiance of tradition. Domenico Fontana, Maderna, Bernini, and Borromini were its greatest representatives. Its masters produced sometimes a grandiose work like Bernini's colonnades of St. Peter or a logical church façade, though Maderna failed utterly in that of St. Peter's and succeeded better only in smaller buildings such as Santa Susanna. The works of Longhena (q.v.) at Venice were exceptions to the general rule of extravagance and bad taste. As in every final style of an architectural period, the picturesque predominated over the monumental. Rich colored marbles, heavy details of cupids, scrollwork, and architectural motives, even imitations in metal and marble of stuffs, as in Bernini's famous baldachin, are prominent.

France.—The close political relations of Italy with France and the habit of calling in Italian artists, consequent upon the campaigns in Italy of Charles VIII, Louis XII, and Francis I, led to the introduction of Renaissance forms into France sooner than elsewhere; at the same time the strength of French Gothic traditions not only retarded the prevalence of Renaissance forms, but led to an internal reform rather than to the adoption of an Italian style. Religious architecture had been for some time on the wane and palace architecture in the ascendant. The first indications are most evident in decoration, where Lombard models prevail. The transitional period illustrated in the Château de Gaillon and in the older part of that of Blois (q.v.) is still prevailingly mediæval; but with Francis I Gothic outlines tend to disappear and the classic orders to prevail. But it was not the foreign but the native artists to whom the fundamental changes were now due: first to the men of North France, like Fain and Viart; then to those of the royal domain, like Le Breton and Lemercier; while others, like Chambiges in his unique Château of Saint-Germain, remain outside of the Renaissance orbit even towards the middle of the sixteenth century. The greatest achievement was the transformation of the feudal castle into a superb and artistic residence, totally unlike anything known in Italy: such were Amboise, Blois (q.v.), Fontainebleau (q.v.), and especially Chambord (q.v.), with its great corner bastions and its forest of dormer windows, chimneys, and towers, a characteristic feature in which French differs so fundamentally from Italian Renaissance. These royal residences were almost rivaled by those of the nobility like Azay-le-Rideau and Chenonceaux (q.v.).

The closing years of Francis I (died 1547) usher in a more classic style. Some of its leaders, like Jean Bullant, Du Cerceau, and Philibert de l'Orme, studied in Italy; others, like Pierre Lescot, were undoubtedly familiar, through drawings, with Italian buildings. Lescot's creation of the Louvre (q.v.) (1546) is the classical example of the new style of royal palace without a trace of mediævalism and is if anything superior to the contemporary work of San Gallo, Vignola, and Sansovino in Italy. One of its great charms lies in the magnificent sculptures of Jean Goujon and others, which make it unique in its decorative scheme. De l'Orme's Tuileries (q.v.) and Château of Anet were his masterpieces. Under Francis I, Henry II, and Charles IX France was covered, especially in the region of the Loire, with châteaux of similar types, with civic structures like the town halls of Beaugency and Paris and with innumerable city houses of the nobility and bourgeoisie. The changes brought about by a further influx of Italian ideas under Maria de' Medici involved loss of charm as well as force in later works. Additions were made to the royal palaces, such as the Tuileries, the Louvre, and Fontainebleau, and a new palace, the Luxembourg (q.v.), was built by one of the leaders of the new school, Salomon de Brosse, who improved upon his Italian model, the Pitti Palace. Lemercier was very successful in his additions to the Louvre and in the Sorbonne. Through all this middle period there is a constant struggle between Italian classic and baroque tendencies and the French love of the picturesque, but French architects did not go to the extreme either of scientific frigidity or lawless eccentricity.

Under Louis XIV a more fanciful interior decoration mingled with the formal Palladian external architecture. Mansart showed in his colossal palace of Versailles the chilling effects of this formal classicism, but he achieved greater success in his dome of the Invalides. The masterpiece of the time was, however, the superb Corinthian colonnade of the east front of the Louvre, by which the palace was completed, from the designs of Perrault. The interior decorative work of this period in France has an originality and a delicacy that place it as much above contemporary work in Italy as the early decoration had been inferior. Under Louis XV Italian ideas obtained complete possession of exterior design and of church architecture both exterior and interior, though in domestic architecture the interior decoration and furniture display a remarkable fantastic originality. The Paris Pantheon by Soufflot (q.v.) represents the formal Roman classicism that prevailed in the latter part of the eighteenth century.

Germany.—Renaissance architecture made its way more slowly in Germany than elsewhere, except in England; partly, no doubt, because the movement was so largely concerned with religious questions. When the new style entered Germany it was from Carinthia, Bohemia, and Tirol rather than from Italy, and Italian architects were employed in Prague, Cracow, Gran, and Vienna long before the creation of the earliest examples of the style even in south Germany, while the northern states were still slower in receiving it. The real transformation of German architecture began after the Peace of Augsburg (1555), and is to be seen in the castles of the princes and barons, the houses of wealthy burghers, and guilds, and the Rathäuser of the town councils, rather than in royal palaces or in religious buildings. Indeed, St. Michaels, Munich, is the only really important church edifice of the sixteenth century in all Germany (1582). Until the Italian baroque style invaded Germany, late in the seventeenth century, the Germans retained unchanged many of their national and mediæval features—high roofs, vast stepped gables of fanciful outline, dormers running through two or three stories, spiral stair towers, oriels, the irregular plans of the feudal castles, and a predilection for fantastic and picturesque combinations of form and detail. The orders appear rarely except in portals or in pilasters, and then treated with utter disregard of classic canons, and court arcades of the classic type are not to be found. The style appears, therefore, at its best in the smaller street fronts of narrow houses, or the picturesque masses of castles on the hillsides, as at Torgau, or in the highly ornate Otto Heinrichsbau (1554) and Friedrichsbau (1601) of the great castle at Heidelberg, which are generally considered the masterpieces of the first period. The town halls of Altenburg, Danzig, Augsburg, Rothenburg, and Bremen (from 1562 to 1612), and others of less importance, form another interesting group of examples of the style. In the later or baroque period there were many palaces erected or enlarged, of moderate architectural interest, except in the case of the Zwinger at Dresden (1711), which is one of the finest and most consistent examples of the rococo extant; and there were also a number of interesting churches in this style (e.g., Marienkirche at Dresden). Landscape architecture after the style of Versailles was highly developed in this period.

Belgium and Holland.—In these closely related countries Renaissance architecture developed very differently, though late in both. Belgium was strongly affected by both French and Spanish influences, as in the fantastic semi-Spanish episcopal palace at Liége by Borset (1508), and produced but one monumental edifice of classic type, the Antwerp town hall (1564). As in Germany many of the most characteristic Renaissance works are guildhalls and narrow street fronts, as on the great square at Brussels, the boatmen's house at Ghent, etc. Even more successful were many sumptuous choir screens, altars, and pulpits, both in Belgium and in Holland. In the latter country the Renaissance produced almost no works of real importance, though some of the Dutch town halls are worthy of notice, as at The Hague (1565), Amsterdam (1655), and Leyden (1597). With these may be classed also the Amsterdam Bourse, and in Denmark the Exchange at Copenhagen. The use of brick, of stepped gables, and of a naïf style of design gives a certain charm to many less important Dutch buildings.

Spain.—Although the Renaissance in architecture entered Spain largely through the work of Flemish artists, it developed more rapidly and produced more important works than in Flanders. The exuberant decorative spirit of Spanish late Gothic and Moresque art appears in the elegant detail of the plateresque, as the early phase of the Renaissance in Spain is called, in such structures as the Santa Cruz Hospital at Toledo, the College at Alcalá de Henares, and the Ayuntamiento at Seville, all between 1500 and 1520. About 1525 church architecture was radically modified by the new style, as shown in the cathedrals of Jaén (1525) and Granada (1529) and San Domingo at Salamanca. But hardly had this begun when Berruguete returned from Italy and brought with him the High Renaissance in the Palladin form, which was further developed by Herrera. This second phase of Spanish Renaissance is called the Græco-Roman, and it ruled until the close of the seventeenth century. The palace of Charles V at Granada is a noble structure by Machuca and Berruguete, rusticated below, colonnaded above, of good proportions and well planned. One building especially corresponds in its vastness to the greatness and character of Spanish power, viz., the Escorial (q.v.), a huge rectangle, simple and uninteresting except in its domical church, which is an impressive edifice of classic style. In such works as these Italian ideas are reproduced with greater fidelity and absence of local national traits than in any other country. On the other hand, when under the leadership of Churriguera an extreme form of baroque or rococo pervaded Spain, the national leaning towards elaborate detail and overdecoration of surfaces ran riot as never before. Some of the royal palaces (Madrid and San Ildefonso) built in the eighteenth century escape it, but with few exceptions it prevailed.

Portugal hardly holds any independent position. Its masterpiece of the sixteenth century, the group of monuments at Belem, is the *comble* of luxuriant expression of the mixed late Gothic and pseudo-Renaissance design.

England.—Latest of all countries to employ the Renaissance style was England. Under Elizabeth and James I (1558–1625) there were sporadic examples and a sprinkling of the new style of decoration in Tudor work. There were some Italian artists, like Torrigiano and Giovanni of Padua, but they had to adapt themselves to Tudor requirements, except in a few cases such as the Caius Gate at Cambridge. Many splendid manor houses built during this reign show, however, the gradual invasion of the classic pilaster, entablature, and arch (Longleat, Wollaton, Burghley, Montacute, etc.). Inigo Jones (1572–1652) changed the trend of architecture and led to the universal adoption of the pure Italian High Renaissance of the Palladian type before the middle of the seventeenth century, his happiest effort being the palace at Whitehall (q.v.). His work was carried forward by Wren, whose masterpiece, St. Paul's Cathedral (q.v.), is one of the great buildings of Europe. It combined the Renaissance groups of domes with the typical ground plan of an English Gothic cathedral. Wren's sobriety and consistency gave a character of good taste to all contemporary English architecture, which continued throughout the eighteenth century under the leadership of men like Van Brugh, the designer of Blenheim, Hawksmoor, and Gibbs, who built St. Martins-in-the-Fields and the Radcliffe Library, Oxford. These men and their successors, Chambers, Adams, Taylor, and Dance, show a progressive degeneration in point of originality up to the close of the century, when the wave of purely Greek Renaissance struck England and was embodied in buildings like the Bank of England (see Soane), the British Museum (q.v.), the Fitzwilliam Museum, Cambridge, and the fine St. George's Hall, Liverpool. See Earring; Interior Decoration; Lombardy, Renaissance Architecture of; Painting; Sculpture; also Plate of Furniture and of Textile Printing.

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RENAIX, re-nȧ′. A town of Belgium, in the Province of East Flanders, picturesquely situated, 24 miles by railway south of Ghent (Map: Belgium, B 4). It manufactures fine linen and damasks, woolen fabrics, tobacco, and pottery. Pop., 1900, 20,090; 1910, 22,324.

RE′NAL DISEASE. See Bright's Disease; Calculus; Cirrhosis.

RENAN, re-näɴ′, Ernest (1823–92). A French religious historian and Semitic philologist, born at Tréguier in Brittany, Feb. 27, 1823. Of his childhood he told in *Souvenirs d'enfance* (1883). He lost his father in youth and owed it to a devoted sister that he could begin with neighboring priests the studies for which his frail health seemed to designate him. He was soon summoned to Paris and promoted to Saint-Sulpice, the chief training school of the French priesthood. At 22 he abandoned his study for orders and taught Latin in a clerical school, still aided by his sister's savings, till at 25 he won his doctorate with such distinction as to assure a position that was already recognized by an academic prize for an essay *Sur les langues sémitiques.* He won a second prize in 1850 for an essay, *Sur l'étude du grec dans l'occident au moyen-âge,* was sent by the Academy to Italy, where he prepared an epoch-making work on Arab philosophy, *Averroès et l'Averroisme* (1852), and to Syria (1860), where he found inspiration for his *Vie de Jésus* (1863), the first of seven volumes that occupied him from 1867 to 1881, dealing with the origins of Christianity to the death of Marcus Aurelius. To this he added as an introduction *L'Histoire du peuple d'Israël* (1888–94). Though elected professor of Hebrew in the Collège de France (1862), he was not allowed to lecture, because of his expressed unorthodoxy. This gave wide popularity to his ideas and allowed him more leisure to propagate his enthusiastic belief that politics, education, and ethics itself would be regenerated by the progress of science, especially of history and philology. The *Vie de Jésus* was widely translated (popular ed., New York, 1912); 300,000 copies were sold in France alone, and for every later work of Renan there was a popular as well as a scholarly demand. *Les apôtres* (1866) and *St. Paul* (1869) were followed by a volume of essays on contemporary questions (1868). Then came the Franco-German War, which evoked from Renan two remarkable letters to David Strauss, the radical biblical critic of Tübingen, showing a patriotism free from every taint of chauvinism. The Republic restored his professorship and he now published *L'Antechrist* (1873); *Les évangiles et la seconde génération chrétienne* (1877); *L'Eglise chrétienne* (1879); *Marc-Aurèle et la fin du monde antique* (1881). Volumes of essays with the titles *Etudes* (1857), *Essais* (1859), *Mélanges* (1878), *Nouvelles études* (1884), *Discours* (1887), accompanied or followed his more connected work. His *Drames philosophiques* were first collected in 1888. A vision of *L'Avenir de la science,* written in 1848, was given to the world as a sort of parting gift in 1890. During his last years Renan enjoyed all the honors, public and private, that Paris could give to a favorite scholar. He was made Grand Officer of the Legion of Honor and administrator of the Collège de France, dying as he had wished, at his post (Oct. 2, 1892). Renan saw so many sides of his subject that he was never as sure of any of them as he was of his own critical wit. He was by turns hazy, cautious, mythical, ironic, idealistic, skeptic, all with a romantic sentiment and a rosy optimism that regarded the nineteenth as "the most amusing of centuries," to be contemplated with "benevolent and universal irony." He had a lofty conception of moral duty and held that "few persons have a right not to believe in Christianity." He knew that he himself was "a tissue of contradictions, one half fated to be employed in destroying the other," and he said this fact gave him "the keenest intellectual pleasure that man can enjoy." He typifies the skepticism of modern France, its awakening religious curiosity, its dilettante shrinking from "the horrible mania of certainty," its Protean inconsistency and its easy tolerance, born of a conviction that no faith is worth a struggle, much less a martyrdom. Of Renan's works there is no uniform edition. To the writings named above may be added many linguistic studies in the *Mémoires* of the Academy and in the *Journal Asiatique*, important contributions to the monumental *Histoire littéraire de la France* (vols. xxiv–xxx), translations of *Job* (1858), *The Song of Songs* (1860), *Ecclesiastes* (1881), and many lesser essays. The titles and dates of the *Philosophic Dramas* are *Caliban* (1878); *L'Eau de jouvence* (1880); *Le prêtre de Némi* (1885); *1802: dialogue des morts* (1886); *L'Abbesse de Jouarre* (1887). There are English translations of the whole *Histoire du peuple d'Israël* and of the *Origines du christianisme*, of the *Etudes* and *Nouvelles études*, of *Job* and the *Song of Songs*, and of the *Souvenirs*.

Bibliography. For Renan's life and character, consult his own *Souvenirs d'enfance et de jeunesse* (Paris, 1883; new ed., Boston, 1902), his *Feuilles détachées* (ib., 1892), and *Lettres intimes* (ib., 1896); also: F. W. H. Myers, in *Essays: Modern* (London, 1883); Paul Bourget, in *Essais de psychologie contemporaine* (5th ed., Paris, 1889); G. E. Saintsbury, in *Miscellaneous Essays* (London, 1892); Henri Despartes, *Ernest Renan: sa vie et son œuvre* (Paris, 1893); Gabriel Séailles, *Ernest Renan: essai de biographie psychologique* (ib., 1894); Francis Espinasse, *Life of Ernest Renan* (London, 1895); Edouard Rod, in *Les idées morales du temps présent* (Paris, 1897); Eduard Platzhoff, *Ernst Renan: ein Lebensbild* (Dresden, 1900); H. G. A. Brauer, *Philosophy of Ernest Renan* (Madison, Wis., 1903); W. F. Barry, *Ernest Renan*, in "Literary Lives Series" (New York, 1905); Hippolyte Parigot, *Renan: l'égoisme intellectuel* (Paris, 1909); Irving Babbitt, in *The Masters of Modern French Criticism* (New York, 1912); Mariette Soman, *La formation philosophique d'Ernest Renan* (Paris, 1914); Frank Harris, in *Contemporary Portraits* (New York, 1915).

His son Ary (1858–), born in Paris, became known as a landscape and figure painter and art critic, and was a pupil of Delaunay and of Puvis de Chavannes. He began to exhibit in the Salon in 1880, contributed many critical essays to the *Gazette des Beaux-Arts*, of which he afterwards became secretary, and in 1900 published an interesting monograph on Gustave Moreau (q.v.).

RENARD, re-när′, Alphonse François (1842–1903). A Belgian mineralogist and geologist, born at Renaix. He studied theology, superintended the Collège de la Paix at Namur in 1866–69, attended the Jesuit training school at the abbey of Maria Laach, and was ordained a priest in 1877. He had also studied natural sciences at the University of Vienna, and held the chair of chemistry and geology in the Jesuit college at Louvain in 1874–82. In 1877 he was also appointed curator of geology at the Museum of Natural History of Brussels, and from 1888 until his death was professor of geology at the University of Ghent. In 1901 Abbé Renard, as he was called, renounced his priestly vows. Besides other valuable papers his studies with Sir John Murray on the results of the *Challenger* expedition to investigate deep-sea deposits are considered especially important; they were published in 1891.

RENA′TUS CARTE′SIUS. See Descartes, René.

RENAUDOT, re-nō′dō′, Théophraste (1586–1653). A French physician and philanthropist. He was born of a Protestant family at Loudun (Vienna), where he practiced for a short time after studying surgery in Paris. In 1605 he received the degree of doctor of medicine from the University of Montpellier. Called to Paris by Richelieu (1612) to develop a plan of assisting and helping the poor, whose number was increasing greatly in France, especially in the capital, Renaudot received the titles of physician and councilor to the King. Because of his religion and of his connection with the University of Montpellier, representing liberal ideas, as contrasted with the Jesuitical University of Paris, Renaudot met much hostility. His *bureau d'adresse* was an intelligence office, labor bureau, and charity organization combined. In 1637 he opened the first pawnshop (mont-de-piété) in Paris, on a plan taken from Italy and originally from Germany. Soon afterward he started a free dispensary for the poor and offered a free course of lectures on scientific subjects. The lectures and the dispensary aroused the ire of the orthodox medical faculty, and Guy Patin in 1640 started a campaign against Renaudot, his institution, teachings, and methods. After the death of Richelieu (1642) and of his royal master, Louis XIII (1643), Renaudot had to close his labor bureau and pawnshop, and was forbidden to practice medicine in Paris. But he was permitted to retain the editorship of the weekly *Gazette de France*, the first French newspaper, which he had started in 1631 under the protection of the cardinal. Mazarin appointed him historiographer to the King in 1646. The lectures of the years 1633–42, in which latter year they were suppressed, were published by Renaudot in 1651 as *Recueil des conférences publiques.* He also wrote biographies of the Prince de Condé, Marshal de Gassion, and Michel Mazarin.

RENAULT, re-nō′, Louis (1843–). A French jurist, born at Autun. From 1868 to 1873 he taught Roman and commercial law at Dijon, and then went to Paris, becoming professor at the School of Political Sciences in 1874 and professor of international law at the university in 1881. He became a counselor of the French Foreign Office in 1890, was president of the Institute of International Law, and was a member of The Hague Tribunal. In 1905, with Gram, of Norway, he decided the Japanese house-tax case against Japan and in favor of Great Britain, France, and Germany. He received half the Nobel peace prize in 1907. Renault was given honorary degrees by Oxford and Christiania, and was a member of the French Institute, a fellow of the British Academy, and an honorary Knight

Grand Cross of St. Michael and St. George. He also wrote *Introduction à l'étude du droit international* (1879) and, with Lyon-Caën, *Traité de droit commercial* (1889–97). He was director of the *Archives diplomatiques* (1880–1900).

RENDALL, rĕn′dal, Gerald Henry (1851–). An English educator, born at Harrow, where his father was assistant master. He was educated at Harrow and at Trinity College, Cambridge, of which he became fellow and where he was lecturer and assistant tutor in 1875–80. He was principal of University College, Liverpool, and Gladstone professor of Greek in 1880–97, and then was the first head master of Charterhouse School until 1911. He did valuable work on early Christian (and contemporary) authors, publishing: *Text and Commentary to Epistle of Barnabas* (1877), edited by Cunningham; *The Emperor Julian, Paganism, and Christianity* (1879), Hulsean prize essay for 1876; versions of Marcus Aurelius (1897, 1901); *Epistles to the Corinthians* (1909); *Charterhouse Sermons* (1911); *John Smith, of Harrow* (1912).

RENDSBURG, rĕnts′bụrk. A town in Schleswig-Holstein, Prussia, situated on the Eider and the Kaiser Wilhelm Canal, about 15 miles south of Schleswig (Map: Germany, C 1). It has a thirteenth-century church, a Gymnasium, a Realschule, and manufactures of woolens, pianos, fertilizers, meat products, leather, and artificial stone. It carries on a considerable trade in lumber and cattle. Rendsburg is first mentioned in the twelfth century. Pop., 1900, 14,757; 1910, 17,315.

RENÉ, re-nā′, surnamed The Good (1409–80). Count of Provence, Duke of Anjou and Lorraine, and titular King of Naples. He was born at Angers, Jan. 16, 1409, being the second son of Louis II of Anjou and Provence. He married Isabella of Lorraine and claimed the succession to the Duchy of Lorraine in 1431, after the death of his father-in-law, Duke Charles. Being opposed by another claimant, the Count of Vaudemont, René was defeated and taken prisoner, remaining a captive for several years. In 1434 he inherited Provence and Anjou on the death of his brother, Louis III. In 1437 he purchased his liberty and the possession of Lorraine by the payment of an immense sum. He now led an army into Italy to secure the Kingdom of Naples, the title to the succession to which had been left to him by Louis III, who had been adopted as her successor by Queen Joanna II, by whom René had been declared heir on the death of his brother. (See Joanna II.) He had a powerful rival in Alfonso V (q.v.), King of Aragon, who succeeded in capturing Naples in 1442. René abandoned the Kingdom and returned to Provence, where his court at Aix became a famous resort for artists and poets. He sought to revive the poetry of old Provence, and his devotion to the forms of a rapidly disappearing chivalry gained him the name of the last of the troubadours. He refused the crown of Aragon when offered to him, but allowed his son to accept it. His daughter, Margaret, married Henry VI of England. After a long and prosperous rule René died at Aix. He had no direct heirs and his possessions, therefore, reverted to the French crown. Consult *Œuvres du roi René*, edited by Quatrebarbes (4 vols., Angers, 1844–46); Leroy de la Marche, *Le roi René: sa vie et ses travaux* (Paris, 1875); Edgcumbe Staley, *King René d'Anjou and his Seven Queens* (New York, 1912).

RENÉE (re-nā′) **OF FRANCE** (It. *Renata*) (1510–1575). A French princess, daughter of Louis XII, born at Blois and married in 1527 to Ercole II, of the house of Este (q.v.), Duke of Ferrara. With him she differed greatly on religious matters, being a zealous supporter of the Reformation, of Calvin, to whom she gave refuge in 1535, and of Bruccioli, who dedicated to her his version of the Bible in Italian. During the Inquisition she was imprisoned (1554), confessed and attended mass, but after her liberation returned to Protestantism. After her husband's death (1559) she settled in Montargis, where she protected her coreligionists during the civil wars. Calvin wrote her many letters of counsel. Consult Millicent Fawcett, *Five Famous French Women* (London, 1905).

RENEVIER, rĕn′vyȧ′, Eugène (1831–1906). A Swiss geologist, born and educated in Lausanne. There he became professor of geology, paleontology, and mineralogy in 1857, curator of the Vaudois Geological Museum in 1864, and a founder of the Swiss Geological Society and of the Paleontological Association (1874). Besides many important contributions to periodicals and work on the international geological chart of Europe, he wrote: *Description des fossiles du terrain Aptien* (1854–58), with Pictet; *Notices . . . sur les Alpes vaudoises* (1864–79); *Carte géologique des Alpes vaudoises* (1875–77); *Orographie des Hautes Alpes* (3d ed., 1881); *Chronographie géologique* (1897).

REN′FREW. A county of southwest Scotland, bounded on the north and west by the River and Firth of Clyde, on the south by Ayrshire, and east and north by Lanarkshire (Map: Scotland, D 4). Area, 240 square miles. Renfrew is very uneven in its surface and consequently in the nature and quality of its soil. At the Hill of Stake, on the Ayrshire border, the land rises to 1711 feet. Over two-thirds of the arable land is devoted to dairy farming. There are extensive mineral deposits in the county, and the exportation of coal, oil, and ironstone employs a large number of people. Chief towns, Renfrew, the capital, Greenock, Port Glasgow, and Paisley (qq.v.). Pop., 1901, 268,900; 1911, 314,552.

RENFREW. A royal, parliamentary, and municipal burgh, capital of Renfrewshire, Scotland, on the Clyde, 6 miles west-northwest of Glasgow (Map: Scotland, D 4). The Renfrew Grammar School and Blythswood Testimonial, originally endowed by charter of Robert III, is here. The inhabitants are employed in ironworks and in shipbuilding. Pop., 1901, 9297; 1911, 12,565.

RENFREW. A town in Renfrew Co., Ontario, Canada, situated on Bonnechère River and on the Grand Trunk and Canadian Pacific railways (Map: Ontario, J 2). The town has a collegiate institute and drill hall. Manufactures include refrigerators, machinery, foundry products, butter, flour, hosiery, sashes and doors, etc. Pop., 1901, 3153; 1911, 3846.

RENI, rā′nė, Guido (1575–1642). An Italian painter, one of the chief masters of the Eclectic school. (See Bolognese School of Painting.) Born at Calvenzano, near Bologna, Nov. 4, 1575, the son of a musician, he was apprenticed at an early age to Denys Calvaert. He then studied under the Carracci, especially under Lodovico, but aroused their jealousy, and soon parted company with them and applied himself to the technique of fresco painting under Ferrantini. His first short visit to Rome in 1599, in company with Francesco Albani, a friend and fellow student, was given chiefly to the study of Raphael, and after some years of further study at Bologna of nature and of classic models, we find him again at Rome in 1605. His development was marked by works very dissimilar in style, those of his early years partaking of the manner of Caravaggio, as, e.g., the "Crucifixion of St. Peter" (1606, Vatican), the "Madonna della Pietà" (Pinacoteca, Bologna), and "The Hermits St. Paul and St. Anthony" (Berlin Museum). From this influence, however, he soon freed himself, forming a style of his own, tinged with refined idealism, in strong contrast to the coarse realism of Caravaggio, and exemplified by the "Concert of Angels" (1608), a charming fresco in the chapel of Santa Silvia (San Gregorio, Rome), and the world-famed "Triumph of Phœbus," generally known as "Aurora" (1609, fresco in the Palazzo Rospiglioso, ib.), his great masterpiece of this period, unequaled in nobility of line and poetry of color.

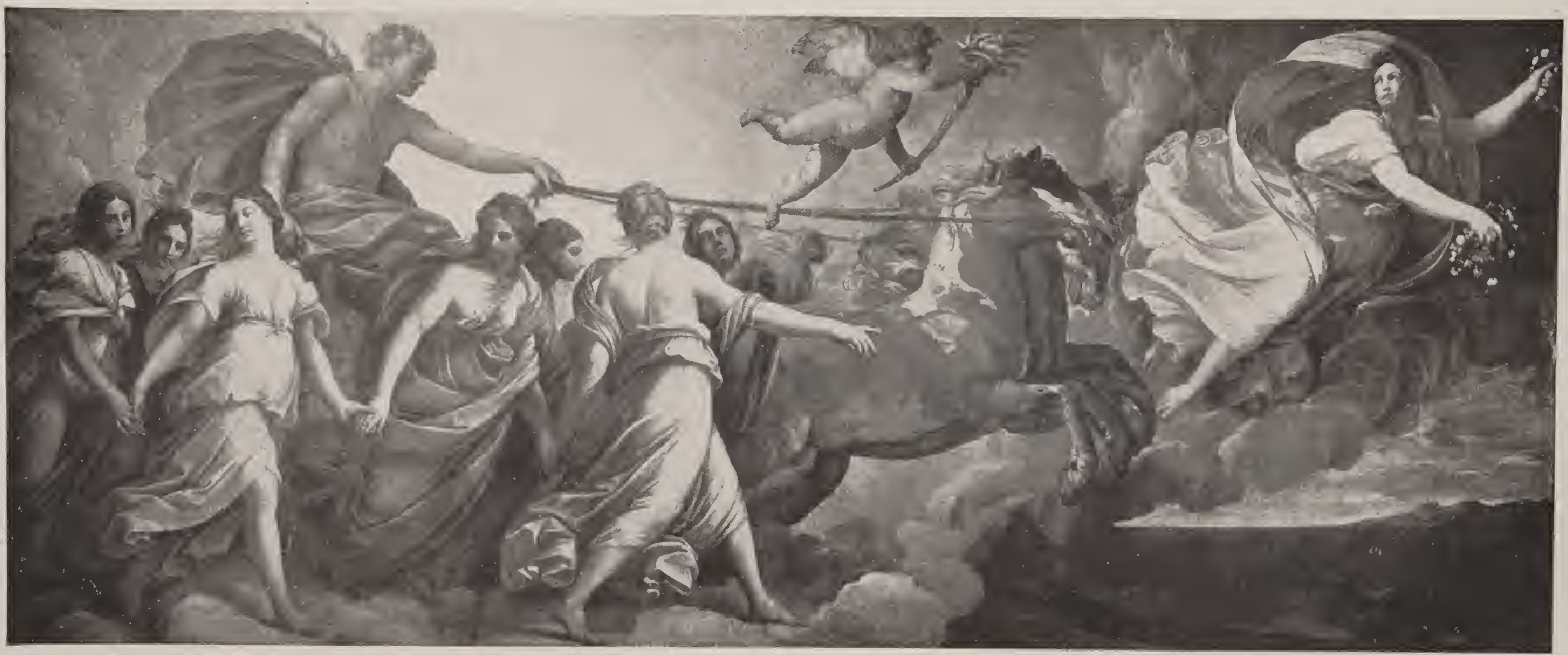
In 1610 Pope Paul V commissioned Guido to decorate the chapel in the Quirinal and other private chapels, which works increased his reputation as well as the number of his enemies, even the friendship of Albani turning into antagonism. After his return to Bologna in 1612, Guido painted "St. Paul Reproaching St. Peter" (Brera Gallery, Milan), quite Venetian in conception; the "Massacre of the Innocents" (Pinacoteca, Bologna), a work full of vigor and resplendent in that warm golden tone characteristic of the artist's middle period; the "Apotheosis of St. Dominic," an imposing fresco in San Domenico, Bologna; "Four Episodes from the Myth of Hercules" (Louvre). In 1620 he decorated a chapel in the cathedral at Ravenna, and in 1621 he went to Naples, commissioned to execute frescoes in the cathedral, but was compelled by the murderous jealousy of the Neapolitan painters to flee to Rome without accomplishing his task. Forced by intrigues to leave Rome, too, in 1622, he returned to Bologna, where he became the acknowledged head of the Eclectic school and resided until his death, Aug. 18, 1642. The tone of his pictures gradually changed to a pale silvery gray, and in the later part of his life his manner became slight and sketchy, his constant pecuniary difficulties, caused by his inveterate passion for gambling, inducing him to paint with careless haste to retrieve his heavy losses.

The most important works of the next decade were the "Triumph of Samson over the Philistines" (Pinacoteca, Bologna), still in his purest golden tone; a "Judith" (Palazzo Adorno, Genoa); "Fortuna" (Accademia San Luca, Rome), one of his finest treatments of female form; and, above all, the "Rape of Helen" (c.1630, Louvre). Masterpieces in his silvery manner include the famous representations of "St. Sebastian" (the finest in the Pinacoteca, Bologna; others in the capitol, Rome, and in the Louvre) and the "Nativity" (Liechtenstein Gallery, Vienna, an unfinished replica in San Martino, Naples), pronounced by some authorities the artist's finest creation. Favorite subjects with him and his school were the "Ecce Homo," the most celebrated specimens of which are those in the Vienna (two), London, Bologna, and Dresden galleries; the "Cleopatra," best in the Madrid Museum and the Palazzo Pitti, Florence; and the "Penitent Magdalen," of which the Louvre and the Liechtenstein Gallery, Vienna, contain each two examples, the Madrid Museum, the National Gallery, London, and the Pinakothek in Munich each one. The type of melancholy beauty, familiar through the supposed portrait of "Beatrice Cenci" (1599) in the Palazzo Barberini, Rome, frequently recurs in his paintings. In his art Guido is an Eclectic, lacking in originality. From a technical standpoint his works are good, as regards color, composition, and drawing; but they are full of sentimentality, and he was one of the first to introduce the soft style so disastrous to the development of art. Consult: Bolognini-Amorini, *Vita del celebre pittore Guido Reni* (Bologna, 1839); Janitschek, in Dohme, *Kunst und Künstler Italiens*, vol. iii (Leipzig, 1879); *Masters in Art*, vol. iv (Boston, 1903); Max von Boehm, "Guido Reni," in *Künstler-Monographien*, No. 100 (Bielefeld, 1910); and the authorities referred to under Bolognese School of Painting.

RENIER, re-nyȧ′, Léon (1809–85). A French archæologist, born in Charleville (Ardennes) and educated at Rheims. For a time he was a proof reader and then became instructor and principal in the College of Nesle in Picardy. Then he went to Paris, taught Latin and Greek for several years, collaborated with Philip Le Bas on the *Dictionnaire encyclopédique de la France* (1840–45) and on Didot's *Encyclopédie*, and was an editor of Courtin's *Encyclopédie moderne* (1845–51). In 1860, after thirteen years in the Sorbonne Library, he became its director and in 1861 professor of epigraphy at the Collège de France. His great educational work was the foundation of the Ecole des Hautes-Etudes, with Duruy, in 1868. A part of Borghesi's works was edited under his care, and he took a prominent part in the excavations of the Farnesi Gardens, and in the purchase of the Campana collections. His work on the inscriptions of Gaul was not completed; his most important publication was *Inscriptions romaines de l'Algérie* (1855–58). Consult S. Reinach in *Biographisches Jahrbuch*, vol. viii (Berlin, 1885), and E. Chatelain in *Revue de Philologie*, vol. x (Paris, 1886).

RENIER, rȧ-nyâr′, Rodolfo (1857–1915). An Italian editor and critic, born at Treviso. In 1882 he became professor of Neo-Latin languages and literature at the University of Turin. He became widely known as the editor of the *Giornale Storico della Letteratura Italiana*, which he and Francesco Novati founded in 1888. To this journal he contributed many critical articles. For some time the same editors published also the *Studi Medievali*. Renier was author of *La Vita Nuova e la Fiametta* (1879); *Il tipo estetico della donna nel medio evo* (1885); *Svaghi critici* (1910).

REN′NELL, James (1742–1830). An eminent British geographer and explorer. He lost his father when a mere boy, but found a home in his native town in the family of Mr. Burrington, vicar of Chudleigh, from whom he received his early education. When fourteen years old he joined the frigate *Brilliant* as midshipman, and five years later was an officer in the British Navy. He had already developed a love for geography by study and his many opportunities for surveying harbors and drawing charts. He left the navy in 1763 because promotion did not seem likely; but he had made such a reputation by his harbor charts that he was appointed Surveyor-General of Bengal by the East India Company. For the next fifteen years he spent most of his



GUIDO RENI

"AURORA," FROM THE FRESCO IN THE ROSPIGLIOSI PALACE, ROME

time in the jungle and on the plains of Bengal. The large amount of map material he collected was used in the preparation of the *Bengal Atlas*, which appeared in 1779, a work of the first importance for strategical and administrative purposes. His map of Hindustan, accompanied by about 200 pages of letterpress, appeared in 1783, and marked the time when Rennell ceased to be merely a surveyor and map maker and became a geographer in the more extended sense. Having received a serious wound in an encounter with a fanatic, Rennell retired from the service in 1777 and lived for the remainder of his life in London, and for fifty years, from 1780 to 1830, he was one of the leading geographers of Europe, and the great critic of geographical work and elucidator of geographical problems. Comfortably established with his wife, Jane Thackeray, great-aunt of the novelist, whom he had married in India in 1772, he now began the construction of the first approximately correct map of India, and many years elapsed before it was superseded by the more accurate trigonometrical survey. He then turned his attention to Western Asia between India and the Mediterranean. He had conceived a scheme for a great work on the comparative geography of Western Asia, but he never completely carried it out, his *Geography of Herodotus*, which formed only a part of the project, occupying him for many years.

Rennell's studies of Herodotus made him a very high authority on all matters relating to African geography, and he became the coadjutor of the African Association when that body inaugurated the modern era of the exploration of that continent. His map of Northern Africa, prepared for the use of the association, was the result of immense research combined with sagacious reasoning. He elucidated the reports of explorers, and his maps illustrated their travels. He constructed the map of the discoveries of Mungo Park. As a hydrographer, also, Rennell made important advances in the study of winds and currents, and was the founder of that branch of geography which is now called oceanography. The current now known as Rennell's current, a stream in the ocean moving northward athwart the mouth of the English and Irish channels, was revealed by his study of a great number of facts collected by seamen. His body was buried in Westminster Abbey.

RENNENKAMPF, rĕn′en-kämpf, Paul K. von (1854–). A Russian general, born in one of the Baltic Provinces. He entered the military service in 1870 and, after attending a military academy, was called to the staff. In 1899 he was given command of the Transcaucasian army, becoming major general the following year, when he helped to subdue the Boxer uprising in China. During the Russo-Japanese War he commanded a division of cavalry and won great distinction by many daring raids. In the revolutionary days of 1905 he was notoriously severe in his repressive measures. In the European War (see War in Europe) Rennenkampf participated in the Russian invasion of East Prussia, but was relieved of his command for failure to reach an important strategical point (the environs of Warsaw) in time to hem in the advancing German armies. In 1915 he was placed on the retired list. Prior to his disgrace he was generally regarded as one of the ablest Russian generals. His own account of the battle of Mukden may be read in *Der zwanzigtägige Kampf meines Detachements in der Schlacht von Mukden* (1909).

REN′NERT, Hugo Albert (1858–). An American philologist, born in Philadelphia. He graduated in 1876 from the University of Pennsylvania, where (after taking the degree of Ph.D. at Freiburg in 1892) he became professor of Romance philology. He was elected member of the Spanish Royal Academy and of the Hispanic Society of America. His writings include: *Spanish Pastoral Romances* (1892); *The Life of Lope de Vega* (1904); *Comedias of Miguel Sanchez; The Spanish Stage in the Time of Lope de Vega* (1909); besides editions of writings of various Spanish authors.

RENNES, rĕn. The capital of the Department of Ille-et-Vilaine, France, at the confluence of the rivers Ille and Vilaine, 155 miles east of Brest by rail (Map: France, N., D 4). It is divided into the upper or new town and the lower or old town. It has remains of its mediæval walls, towers, and gates, beyond which lie extensive suburbs. Bridges unite the two divisions of the town, the older portions of which lie on the left bank of the quay-lined Vilaine. The most noteworthy buildings are the modern cathedral, whose interior is a spacious hall of Grecian architecture, the stately Palais de Justice, the Hôtel de Ville, the Lycée, the Palais Universitaire with its fine art museum, and the handsome modern university. Tree-lined boulevards, the spacious Champ de Mars with a war monument commemorating 1870–71, and the Jardin des Plantes add to the town's attractions. It carries on an active trade and has manufactures of agricultural implements, stockings, lace, sailcloths, and earthenware. The town is the seat of an archbishopric and of a university, with faculties of law, science, and letters, which has an attendance of about 1420. It was almost totally destroyed by a great fire in 1720, and was rebuilt on a modern plan. Rennes is the Celtic Condate, the capital of the Gallic tribe of the Redones, whence the modern name. Under the Romans it was an important station. In the Middle Ages it was the capital of the Duchy of Brittany (q.v.). Pop., 1911, 79,372.

REN′NET (from ME. *rennen, rinnen*, AS. *rinnan, yrnan*, Goth., OHG. *rinnan*, Ger. *rinnen*, to run; connected with Lat. *rivus*, stream, Skt. *ar*, to move). A substance obtained from the fourth or digestive stomach of calves living upon milk and also from the stomachs of puppies and pigs. The active principle is obtained from the folds of the membrane lining the stomach, and is prepared commercially by soaking this lining in warm slightly salted water, filtering the resulting extract, and adding a little salt and saltpetre to preserve it. The active principle, rennin, an enzyme or ferment, has the power of coagulating or curdling the casein of milk. The extracts also contain more or less pepsin, the digestive ferment of the stomach. The action of rennet is impaired by heat, and the ferment is destroyed by high heat. The principal use of rennet or rennet extract is in making cheese, where it is employed to form the curd. See Cheese Making; Enzyme.

RENNET, Cheese. See Bedstraw.

REN′NIE, John (1761–1821). A British civil engineer. He was born at Phantassie, Haddingtonshire, June 7, 1761, and obtained his preliminary education at the parish school of Prestonkirk and supplemented it by two years at Dunbar, where he studied pure mathematics. After serving as a workman he studied at Edinburgh, and in 1784 secured employment at the works of Boulton and Watt at Soho, near Birmingham. Here his mechanical genius soon displayed itself; and so highly did Watt esteem Rennie that he gave him, in 1789, the sole direction of the construction and fitting up of the machinery of the Albion Mills, London; and the ingenious improvements effected in the wheelwork, shafting, and frames were so striking that Rennie at once rose into general notice as an engineer of great promise, starting as a mechanical engineer on his own account in 1791. To this mill engineering he added, about 1799, the construction of bridges, and in this branch also his talent and ingenuity were manifest. The elegance and solidity of his constructions, the chief examples of which were at Kelso, Leeds, Musselburgh, Newton-Stewart, Boston, and New Galloway, were universally admired. Rennie's greatest work of this kind was Waterloo Bridge, over the Thames at London. Another of his works was Southwark Bridge, built on a new principle, with cast-iron arches resting on stone piers. He also drew up the plan for London Bridge, which, however, was not commenced until after his death. He superintended the execution of much canal work, and the London Docks, the East and West India Docks at Blackwall, as well as many others, were all designed and executed under his superintendence. He also planned many improvements of harbors and on the dockyards of Portsmouth, Chatham, Sheerness, and Plymouth, beginning at the last-mentioned port the most remarkable of all his naval works, the celebrated breakwater. Rennie died Oct. 16, 1821, and was buried in St. Paul's Cathedral, London.

His sons GEORGE (1791–1866) and JOHN (1794–1874) carried on their father's work, having studied under him and been associated with him in important undertakings. George built the *Dwarf*, the first screw vessel in the British navy, and from 1845 to 1848 was president of the Institution of Civil Engineers. John was knighted in 1831 upon the completion of London Bridge after his father's plans. Succeeding his father as engineer to the Admiralty, he completed the Plymouth breakwater, about which he wrote in 1848. He published also *Theory, Formation, and Construction of British and Foreign Harbors* (1851–54). Consult Samuel Smiles, *Lives of the Engineers* (London, 1861–62; new ed., 1904), and the *Autobiography* of Sir John Rennie (ib., 1875).

RE'NO. The largest city of Nevada and the county seat of Washoe County, 31 miles north of Carson City, on the Truckee River and on the Southern Pacific, the Virginia and Truckee, and the Nevada, California, and Oregon railroads (Map: Nevada, B 3). It is the seat of the Nevada State University, opened in 1886, and among other features are the United States Agricultural Experiment Station, the State Hospital for Mental Diseases, the Mackay School of Mines, the Carnegie library, Federal and Y. M. C. A. buildings, and the Moana and Laughton mineral springs. Reno is situated near the foot of the Sierra Nevada Mountains, 4484 feet above the sea, in a region devoted to farming, mining, and stock raising. It is on the Truckee-Carson Canal, a government irrigation project extending over 30 miles, watering 206,000 acres and built at a cost of $8,500,000. The city is the most important business and industrial centre in the State, containing extensive railway shops, reduction works, flour and lumber mills, foundries and machine shops, a brewery, plaster works, and meat-packing houses. Settled in 1868, Reno was incorporated as a town in 1879 and as a city in 1899. It was disincorporated two years later, but was again granted a charter in 1903. Pop., 1900, 4500; 1910, 10,867; 1915 (U. S. est.), 14,224.

RENO, JESSE LEE (1823–62). An American soldier, born at Wheeling, Va. (now W. Va.). He graduated at West Point in 1846, was brevetted second lieutenant of ordnance, and soon afterward was ordered to the front in Mexico, where he fought under General Scott from Vera Cruz to the city of Mexico. From that time until 1861 he was employed in various routine duties and in 1860 was promoted captain. On the outbreak of the Civil War he was commissioned brigadier general of volunteers and was assigned to a brigade in General Burnside's North Carolina expedition (Dec. 20, 1861–April, 1862), with which he participated in the capture of Roanoke Island and the actions of Newbern and Camden. For these services he was promoted major general of volunteers, and in August was ordered north to Virginia, where he fought in the second battle of Bull Run and at Chantilly. During the succeeding Maryland campaign he commanded the Ninth Corps, and was killed leading his men at the battle of South Mountain.

RENOIR, re-nwär', (PIERRE) AUGUSTE (1841–). A French figure, portrait, and landscape painter, one of the most important of the Impressionist school. (See IMPRESSIONIST PAINTING.) He was born in Limoges, Feb. 25, 1841, the son of a tailor, and at first devoted himself to painting on porcelain. He then studied in Paris under Gleyre and later became associated with Sisley, Monet, and other Impressionists, taking part in their first exhibition in 1874 and repeatedly thereafter. He also exhibited at the Salon, after many rejections, in 1879, and again in 1881, 1883, and 1890. His place of residence was Paris, with short visits to Italy and northern Africa, until in later life ill health caused his removal to the Riviera, near Nice.

Renoir's art, extending over 40 years, embodies all the characteristics of impressionism. Primarily a figure painter, he excels chiefly in depicting the female nude, and, though often ignoring drawing and perspective, he succeeds marvelously in the subtle rendering of light upon flesh and in producing melting color harmonies. The feminine type he evolved, with soft, voluptuous outlines, grace of movement, and dark dreamy eyes, is fascinating and original. His portraits, especially those of children, are interesting and suggestive. Although his landscapes are criticized for a certain "woolly" technique and lack of harmonious color, they are at best comparable with the masterpieces of contemporary Impressionists, and his flower compositions are unusually fine in color. Good examples are: "The Dancer" and "The Loge" (1874); "Les Grands Boulevard" (1875); "The Swing" and "The Ball at Montmartre" (1877), both in the Luxembourg; "The Rowers" (1881); "On the Terrace"; the "Beautiful Bather" (1881); "Young Girls at the Piano" (1888); "Female Torso" (1906); "Wounded Girl" (1909). Representative portraits are those of his friends Monet, Sisley (1868), Cézanne (1880), a pastel; of Wagner (1893), Madame Charpentier and her children (1878, Metropolitan Museum, New York), and Mademoiselle Samary (1879). Many of Renoir's paintings are in possession of M. Durand Ruel et Cie. Consult: Camille Mauclair, *The French Impressionists* (New York, 1903); Théodore Duret, *Manet and the French Impressionists* (ib., 1910); and the monograph by Mcier Graefe (Munich, 1911).

RENOUARD, re-no͞o′ȧr′, Paul (1845–). A French draftsman, illustrator, and painter. He was born at Cour-Cheverny (Loir-et-Cher) and studied in Paris under Pils, whom he assisted in decorating the Opera House. There he began original work by sketching the ballet, then sought inspiration in the streets, the theatres, the prisons, and finally drew every phase of contemporary life in France and England with an originality of treatment, a verve, decision, and expressive force rarely equaled by a modern draftsman. His art is essentially Impressionist and possesses the absolute truthfulness of the Japanese. Not appreciated in France at the outset, he first gained recognition with sketches for the London *Graphic.* Thereafter he contributed to the leading French, English, and American periodicals. His most noted series are: "The Copyists of the Louvre" (1880); "Irish Sketches"; "The Salvation Army"; "Thirty Etchings on the Opera"; "Seventy-five Drawings on the Dreyfus Case" (1894–99); "Album of Scenes at the Paris Exposition" (1900); "Drawings from Parisian Life for the Liége Exposition" (1905); "The Committee of Ways and Means" (result of a visit to Washington). His masterpiece, however, is the series of 200 etchings and engravings entitled "Movements, Gestes, et Expressions" (1898), embodying his profound study of movement. After 1900 Renouard also painted landscapes, portraits, and genre scenes, among the best known of which are "Change of Decoration" and "The Russian Sovereigns at the Tomb of Napoleon" (1904).

RENOUF, re-no͞of′, Emile (1845–94). A French marine, landscape, and genre painter, born in Paris. He was a pupil of Boulanger, Lefebvre, and Carolus Duran. His works usually represent scenes in the lives of fisher folk or purely marine subjects. "The Helping Hand" (Corcoran Gallery, Washington) is one of his best-known works. He also painted several views near Honfleur and a picture of the Brooklyn Bridge (in the Havre Museum), done while he was in New York City in 1887–88. "After a Storm" is in the Metropolitan Museum, New York. He received a medal of the first class at Munich in 1883 and the Legion of Honor in 1889.

RENOUF, Sir Peter le Page (1822–97). An English Egyptologist, born in the island of Guernsey. He was educated at Elizabeth College (Guernsey) and at Oxford, where he became intimate with John Henry Newman (q.v.). He took an active part in the Tractarian controversy (see Oxford Movement), and in 1842 was received into the Roman Catholic church. Renouf was none too comfortable in his adopted faith, for eventually one of his candid treatises on episodes in the history of the Church was placed on the Index. From 1846 to 1855 he resided on the Continent; thereafter until 1864 he was professor of ancient history and Oriental languages in the Roman Catholic university which Newman unsuccessfully tried to keep in operation at Dublin; and then for 22 years he was a government inspector of schools. During this period he was carrying on important studies in Egyptology. From 1886 to 1891 he was keeper of Egyptian and Assyrian antiquities in the British Museum, and in 1896 he was knighted. From 1887 till his death he held the presidency of the Society of Biblical Archæology, to the *Proceedings* of which he contributed frequently. Therein appeared, with valuable commentary, his masterly translation of the Egyptian *Book of the Dead* (q.v.). Of especial importance also are his Hibbert lectures, *Lectures on the Origin and Growth of Religion, as Illustrated by the Religion of Ancient Egypt* (1880; 2d ed., 1884).

RENOUVIER, re-no͞o′vyȧ′, Charles Bernard (1815–1903). A French philosopher and politician. Born at Montpellier and educated at the Ecole Polytechnique, he became known through his *Manuel de philosophie moderne* (1842) and his *Manuel de philosophie ancienne* (1844). He was considerably influenced by Kant. After the revolution of 1848 he published a *Manuel républicain de l'homme et du citoyen* (1848), which was condemned for its Socialistic propositions. He retired from public life after the coup d'état of 1851. In 1872 he founded *La Critique Philosophique,* of which he was the editor until 1889, and until 1900 contributed to *L'Année Philosophique.* He published, among other works: *Essais de critique générale* (1854); *Science de la morale* (1869); *Esquisse d'une classification systématique des doctrines philosophiques* (2 vols., 1885); *Victor Hugo, le poète* (1893); *La nouvelle monadologie* (1900).

RENO′VO. A borough in Clinton Co., Pa., 28 miles northwest of Lock Haven, on the Susquehanna River and on the Pennsylvania Railroad (Map: Pennsylvania, F 3). It is of some importance as a summer resort, being situated near the Alleghany Mountains, in a picturesque region. Among the noteworthy features are the public hospital and the fine school buildings. There are valuable deposits of bituminous coal and fire clay and shops of the Pennsylvania Railroad, which constitute the chief industrial plant. Pop., 1900, 4082; 1910, 4621.

RENSE, or **RHENSE,** rĕn′ze. A village of Prussia in the circle of Coblenz on the Rhine, noted historically as the meeting place of a diet which in July, 1338, during the struggle between the emperors and the papacy, took a firm stand for the former by declaring that whoever had received a majority of electoral votes was ipso facto German King and Holy Roman Emperor without further papal confirmation.

RENSSELAER, rĕn′se-lẽr. A city and the county seat of Jasper Co., Ind., 71 miles south-southeast of Chicago, Ill., on the Chicago, Indianapolis, and Louisville Railway (Map: Indiana, C 3). It is the centre of a farming district and has cement tile works and flour and lumber mills. Rensselaer is the seat of St. Joseph's College and contains the Monnet School for Girls, a public library, a courthouse, and a Catholic seminary. Pop., 1900, 2255; 1910, 2393.

RENSSELAER. A city in Rensselaer Co., N. Y., on the Hudson River, directly opposite Albany, with which it is connected by three bridges, and on the New York Central and Hudson River and the Boston and Albany railroads (Map: New York, G 5). It manufactures felt, ice tools, chains, dyes, medicines, paper boxes, skirts, furniture, picture frames, and other lumber products, but is important chiefly as a railroad town, having shops, roundhouses, freight yards, etc. Interesting features are Fort Cralo, built in 1642, Memorial Park, the Franciscan Fathers Home, and the Genet Barracks. Rensselaer was known formerly as Greenbush, which was incorporated as a village in 1815. Pop., 1900, 7466; 1910, 10,711; 1915 (State census), 11,213.

RENSSELAER, VAN. See VAN RENSSELAER.

RENSSELAER POLYTECHNIC INSTITUTE. A school of engineering and science founded at Troy, N. Y., in 1824, by Stephen van Rensselaer as the Rensselaer School. It was reorganized in 1850 under the present name as a general polytechnic institute, and was the first school of science and the first school of engineering having a continuous existence to be established in any English-speaking country. The school has long been famous for its engineering courses, and opportunities for investigation and research are offered by the many important engineering works within reach. The main building of chemical laboratories was destroyed by fire in 1904, but since that time much additional land has been acquired and eight new buildings have been erected. These include electrical, mechanical, chemical, physical, and material-testing laboratories, fully equipped with apparatus and machinery of the most modern type. In addition the institute owns valuable mineralogical, geological, and other collections and a library of scientific works containing about 21,000 books and pamphlets. The undergraduate courses include civil, mechanical, electrical, and chemical engineering, leading to the degrees of C.E., M.E., E.E., and Ch.E. A course leading to the degree of S.B. is also given, as well as graduate courses leading to the degrees of master and doctor in science and engineering. The students in all courses in 1915 numbered 646 and the faculty numbered 65. The total assets of the school amounted to about $3,300,000. The president in 1915 was Palmer C. Ricketts, LL.D. Consult Ricketts, *History of Rensselaer Polytechnic Institute, 1824–1914* (New York, 1914).

RENT (OF., Fr. *rente*, It. *rendita*, income, from ML. *rendere*, nasalized form of Lat. *reddere*, to restore, return). In classical political economy, the term "rent," when used without a qualifying phrase, refers to the payment which is made for the use of land. In the payments popularly known as rent are usually included two elements, one of which may be classed as interest on buildings and other improvements, the other as economic rent. The economic rent of any given piece of land is measured by the difference between the value of its products and the cost of the labor and use of capital employed in producing them.

Assuming the conditions of a new community with an abundance of accessible land, good and bad, it is obvious that so long as the produce of the best land is more than sufficient to satisfy the community's wants there will be no rent. Producers will be on an equality, and if any difference exists between the value of the product and the costs of production in labor and capital, it will be the same for all. As population increases the product of the best grade of lands no longer suffices to satisfy the want for food. Prices of food will rise until it will pay to bring inferior lands under cultivation. Permanent prices will have to be sufficient to cover costs in labor and capital upon these inferior lands. Since the cost of production on the better land does not increase, a surplus value will emerge in the produce of these lands. This surplus value is rent. If the owner of the better land cultivate the ground, not in person, but by tenants, this surplus is what the latter can afford to pay the landlord for the use of his land. If the favored producers are themselves cultivators, they receive the rent directly in the increased returns of their husbandry.

This simple illustration suffices to explain the law of rent, which may be briefly stated as follows: rent of land is the difference between the cost of the product and its value, the latter being determined by the cost of production upon the poorest land cultivated. In an isolated community the increase of population and the resulting pressure upon the food supply must always enhance rent, as cultivation must be extended from better to poorer soils. In other words, the pressure of population upon the means of subsistence creates rent on those lands where the means of subsistence can most easily be produced. Again, we may assume all the available land of the community to be in cultivation and yet the pressure upon the means of subsistence increases. Now, even if all the land were uniform in quality but deficient in quantity, rent must appear. No increase of product can be obtained without application of additional labor and capital to the soil. This will not be so fruitful as the first application, and hence the latter must yield a rent. In this phase the law of rent may be stated as follows: the rent of land is the difference between the value of the product and its costs, value being determined by the costs of production for the product due to the least fruitful increment of capital and labor employed in cultivation. It follows that rent is a result, not a cause, of price. This principle was demonstrated by Ricardo and until recent decades was thought to establish a perfectly clear distinction between rent and other economic incomes. The rise of the Austrian school of economists (see POLITICAL ECONOMY) has, however, tended to break down this distinction in incomes. Labor and capital, like land, receive their value from their product. While it is true that no form of goods will long be produced which does not pay the prevailing rates of interest and wages, it is no less true that an agricultural product will not be produced unless it pays the ordinary rate of rent.

One of the most important practical principles that have been deduced from the demonstration of the law of rent is that a tax levied upon rent or upon the value of land, which represents merely the capitalization of the rental value, cannot raise the price to the consumer of the product of the land. This principle has served as a basis for the plan of social reform of Henry George. (See SINGLE TAX.) The fact that every increase in population or in capital increases the return to the landlord quite without his own efforts served as an ethical justification for a plan of appropriation to the state of ground rents. Recent economic theory has widely extended the application of the theory of rent. Since the time of Senior (q.v.) the term has been frequently applied to the net income from monopoly advantages, whether natural or legal. Profit (q.v.) is frequently classed as a form of rent; and Clark applies the term to any form of income which may be described differentially. Consult F. A. Walker, *Land and its Rent* (Boston, 1883), and C. E. Fillebrown, *A B C of Taxation* (New York, 1909).

RENT. In its most ancient as well as its modern sense, compensation payable by a tenant to his landlord for the land held of him. Rent has never been an incident of tenure, but even under the feudal system of landholding and when due from tenant in fee simple to his lord, rent was due only as matter of contract. It was, indeed, the service agreed by the feudal tenant to be performed (*servitium redditum*), which might or might not include a money payment and which varied according to the tenure upon which the land was held, according to the custom of the manor of which it formed a part, or according to the will of the parties.

In much the same way the obligation of the modern tenant for life or years to pay rent to his landlord is based entirely on agreement expressed in the lease or implied from the acts of the parties as to the time and manner as well as the duty of payment. This being so, a failure to pay rent does not ordinarily affect the relation of landlord and tenant so as to enable the landlord to enter and terminate the lease, nor can a tenant by terminating the relation of tenure between himself and his landlord (as by assigning his entire estate to a third person) relieve himself of the obligation to pay the rent agreed. Rent is equally independent of any other violations of duty by either party, excepting only the breach of the covenant for quiet enjoyment implied in every letting of lands.

As already indicated, a failure to pay rent does not in and of itself involve a forfeiture of the tenant's estate. The landlord's property remedy is an action at law for the rent due. At common law, however, he was provided with a more efficacious remedy in the process known as levying a distress. See DISTRESS.

The rents described by Blackstone in his famous chapter on incorporeal hereditaments (Blackstone, II, 41–43) as "certain profits issuing yearly out of lands and tenements corporeal" are obviously a very different thing from those which have just been described. The rent here referred to is a profit *à prendre* in the land of another, and it comes into existence, not by agreement or in connection with a lease, but, as such incorporeal rights always do, by grant or prescription. The right to take the rent is itself a species of real property which may be held, like any other estate, for life or years or in fee, and which is capable of alienation and, if held in fee, of transmission by inheritance. The common law distinguished three kinds of such rents, viz., rent service, rent charge, and rent seck. The rent service was merely the old feudal rent surviving into a period which had forgotten its origin. It existed only when lands were held by one of another in fee and where, accordingly, the rent due was in the nature of a feudal service. The rent charge is the rent just described as arising by grant of the owner of the land on which it is charged. The distinguishing characteristic of this rent was the fact that it was enforceable by distress. The rent seck was merely the rent charge without the power of distress annexed. Of these three forms of rent the rent service is obsolete, excepting, perhaps, in a few manors in England; rent charge survives unchanged except where distress has been abolished, and there all rents charged on land by deed or will are properly rent seck. It is to the class of rents charge rather than of contract rents that we must refer the so-called fee-farm rents. See FEE.

Consult: James Kent, *Commentary on American Law* (14th ed., 4 vols., Boston, 1896); Sir H. J. S. Maine, *Lectures on the Early History of Institutions* (7th ed., London, 1897); Sir William Blackstone, *Commentaries* (4th Amer. ed., 2 vols., Chicago, 1899); T. C. Williams, *Principles of the Law of Real Property* (19th ed., London, 1901); H. T. Tiffany, *The Law of Landlord and Tenant* (New York, 1913). See HEREDITAMENT; INCORPOREAL; LANDLORD AND TENANT; LEASE.

RENTON, rĕn′ton. A city in King Co., Wash., 12 miles south of Seattle, on the Chicago, Milwaukee, and St. Paul, the Northern Pacific, and the Columbia and Puget Sound railroads (Map: Washington, C 3). Coal mining and brickmaking are carried on and there are car works and a briquette plant. Pop., 1910, 2740.

RENTON, SIR ALEXANDER WOOD (1861–). A British jurist, born in Auchtermuchty, Fife, Scotland. He was educated at Edinburgh University, studied law at Gray's Inn, was called to the bar in 1885, began to practice on the Oxford circuit in 1886, and was puisne judge of the Supreme Court of Mauritius in 1901–05 and of Ceylon from 1905 to 1914, when he became Chief Justice. He was knighted in 1915. Renton wrote the valuable *Law and Practice of Insanity* (1896) and edited the *Encyclopædia of the Laws of England* and, with G. G. Phillimore, *The Comparative Law of Marriage and Divorce* (1910).

RENUN′CIA′TION (Lat. *renuntiatio*, from *renuntiare*, to report, renounce, from *re-*, back + *nuntiare*, to announce, from *nuntius*, a messenger). In law, the disavowal or abandonment of an official or property right. Of the latter class are the renunciation by an heir, devisee, or legatee of the property, real or personal, to which by operation of law or under the will of his testator he is entitled. Of the former class is the more frequent case of the refusal by an executor, administrator, or trustee of the office conferred upon him. The formality of renunciation is in either case of the simplest character, a letter or other written expression of intention being the usual form. In Scotland the term "renunciation" is employed to denote the surrender (q.v.) of an estate for life or years to the landlord.

REN′WICK, JAMES (1662–88). A Scottish Covenanter, born at Moniaive, Dumfriesshire. He was a student at Edinburgh University, but received no degree there, because of his refusal to acknowledge Charles II as head of the Church, and therefore finished his theological education at Groningen, Holland. In 1683 he returned to Scotland and began preaching at conventicles. He was outlawed for his collaboration with Alexander Shields in *An Informatory Vindication of the Covenanters* (1684). In 1687 he had become the virtual leader of the Cameronians (q.v.) who were excluded from the Act of Toleration, and was finally captured and executed at Edinburgh.

RENWICK, JAMES (1818–95). An American architect. He was born in New York and was educated at Columbia College. He constructed the distributing reservoir of the Croton Aqueduct in New York City and was for some years an architect on the Erie Railroad. Among the buildings designed by him were the original structure for Vassar College, Poughkeepsie; St.

Patrick's Cathedral and Grace Church, New York; and the Smithsonian Institution and the original Corcoran Gallery, Washington. Renwick left a valuable art collection to the Metropolitan Museum.

REORGANIZED CHURCH OF JESUS CHRIST OF LATTER-DAY SAINTS. This body claims to be the original church of Latter-Day Saints organized by Joseph Smith and others April 6, 1830, at Fayette, N. Y., which contention has been sustained by the courts in every case of litigation where property rights have been at issue. In the case brought in the Court of Common Pleas, Lake Co., Ohio, Feb. 23, 1880, to quiet title to Kirtland Temple property, the decision in part was: "And the Court do further find that the plaintiff, the Reorganized Church of Jesus Christ of Latter-Day Saints, is the true and lawful continuation of and successor to the said original Church of Jesus Christ of Latter-Day Saints, organized in 1830, and is entitled in law to all its rights and property." In the case for possession of Temple Lot in Independence, Mo., brought in the Circuit Court of the United States for the western division of the western district of Missouri, the decision was in perfect accord with the above.

After the death of Joseph Smith in 1844 several local churches remained intact and in 1852 they effected a general organization at Zarahemla, Wis., under the name and title of the Reorganized Church of Jesus Christ of Latter-Day Saints. They reaffirmed the original tenets of the church and published the epitome of faith and doctrine as follows: "We believe in God the Eternal Father, and in his Son Jesus Christ, and in the Holy Ghost; that men will be punished for their own sins, and not for Adam's transgression; that through the atonement of Christ all men may be saved by obedience to the laws and ordinance of the gospel; that these ordinances are: (1) faith in God and in the Lord Jesus Christ, (2) repentance, (3) baptism by immersion for the remission of sins, (4) laying on of hands for the gift of the Holy Ghost. We believe in the resurrection of the body; that the dead in Christ will rise first, and the rest of the dead will not live again until the thousand years are expired. We believe in the doctrine of eternal judgment, which provides that men shall be judged, rewarded, or punished, according to the degree of good or evil they shall have done; that a man must be called of God and ordained by the laying on of hands of those who are in authority, to entitle him to preach the gospel and administer in the ordinances thereof; in the same kind of organization that existed in the primitive church, viz., apostles, prophets, pastors, teachers, evangelists, etc.; that in the Bible is contained the word of God, so far as it is translated correctly; that the canon of scripture is not full, but that God, by His Spirit, will continue to reveal His word to man until the end of time; in the powers and gifts of the everlasting gospel, viz., the gift of faith, discerning of spirits, prophecy, revelation, healing, visions, tongues, and the interpretation of tongues, wisdom, charity, brotherly love, etc.; that marriage is ordained of God and that the law of God provides for but one companion in wedlock, for either man or woman, except in cases of death or where the contract of marriage is broken by transgression." They challenge the claim made by the people in Utah that Joseph Smith received a revelation in 1843 instituting polygamy.

Churches are established in America, Europe, Asia, Australia, and the islands of the ocean. The church numbers about 75,000, with headquarters at Lamoni, Iowa. In 1915 the general officers were: Frederick M. Smith, grandson of the founder, president; Richard S. Salyards, secretary; Frederick A. Smith, patriarch; Edmund L. Kelley, presiding bishop. Heman C. Smith was historian and Clyde I. Carpenter recorder.

REPAIRS′. In the law of real property, such acts of construction and amendment as are necessary to keep the buildings of an estate from deterioration and decay. By the common law of England and America a limited obligation to repair rests on the tenant in possession, whether his estate be for life or years. It is, in fact, an incident of such a tenancy and flows from the liability for waste, and it includes the wholesale restoration of premises destroyed by the negligent or willful wrongdoing of either the tenant, a member of his household, or a stranger, as well as repairs necessary to keep the premises from decay and collapse. It does not, however, extend to damage caused by the elements (acts of God) or to destruction caused by the enemy in time of war, nor generally to the effects of ordinary wear and tear. To some extent in England and generally in the United States this harsh rule of the common law has been modified by statute. The obligation to repair does not extend to a tenant at will or at sufferance, nor to a joint tenant or tenant in common (whether in possession of the premises or not), nor generally to a mortgagee in possession.

This common-law obligation of the tenant to keep the premises in repair is sometimes varied by local custom and more frequently by agreement of the parties. See EVICTION; LANDLORD AND TENANT; LEASE; WASTE.

REP′ARA′TION (Lat. *reparatio*, from *reparare*, to restore, repair, from *re-*, back again, anew + *parare*, to prepare). In law, the redress of an injury by making compensation therefor or by restoring something which has been unlawfully taken from one entitled to its possession. (See DAMAGES.) The term is also used as the equivalent of the repairs required of a tenant for life or years under the law of waste or of the holder of a benefice under the law of dilapidations. See DILAPIDATION; REPAIRS; WASTE.

REPARATION. See REGENERATION, IN PLANTS.

REPEAL (OF. *rapeler*, Fr. *rappeler*, to recall, revoke, repeal, from *re-*, back + OF. *apeler*, Fr. *appeler*, to call, appeal, from Lat. *appelare*, to address, appeal, call, summon). The abrogation of a statute by a subsequent act of a legislative body. Where an act declares in positive terms that another shall be abrogated, it is said to be an express repeal, but where a statute contains provisions inconsistent with a prior one, and does not refer to it directly, it is said to repeal the latter by implication. The provisions of the subsequent act must be absolutely contrary or repugnant to those of the former, so that it is clear that they must have been intended to supersede the former, in order to work out a repeal by implication. An act may repeal only portions of another, and the provisions not thus repealed will continue in force. The same is true where a subsequent statute is only inconsistent with a former one in some of its provisions. Where it is desired to alter some of the provisions of an act, it is usually amended by striking out some part of it and substituting new provisions. An amendment, therefore, is a change or alteration, whereas a repealing act abrogates or wipes out the provisions of the statute to which it applies. See Abrogation; Statute.

REPEALERS. See Party Names.

REPEATING DECIMALS. See Circulating Decimals.

REPEATING RIFLE. See Rifle, Hunting; Small Arms.

REPENT′ANCE (OF., Fr. *repentance*, from ML. *repentens*, repentant, from Lat. *re-*, back again, anew + *pœnitere*, to repent, frequentative of *pœnire*, *punire*, to punish, from *pœna*, punishment, expiation, pain, from Gk. *ποινή*, *poinē*, punishment; connected with Gk. *τίνειν*, *tinein*, Skt. *ci*, to avenge). Sorrow for sin and renunciation of the same. It is intimately connected with faith (q.v.), since faith is the turning of the soul towards God, and repentance is the same act considered as a turning away from sin. It is synonymous with conversion when used of the original and decisive abandonment of sin which marks the beginning of the Christian life; but, unlike conversion, which occurs but once, daily repentance should follow daily sins. It is a consequent of regeneration (q.v.), which is God's act calling forth repentance and conversion. Adequate repentance embraces all sin as such, known or forgotten, and involves the condemning sentence of conscience and the voluntary activity of the will in forsaking it, and both choosing and executing acts of holiness in its place. The motive leading to true repentance must be nothing short of a perception of the evil of sin in itself, as violating the law of conscience and of God. Any lesser motive, as sense of danger or fear of the wrath of God, is not sufficient to produce a true repentance, which must embrace the love of God and sincere submission to His holy will.

REPHAIM, rĕf′ȧ-ĭm *or* rḗ-fȧ′ĭm (Heb. *Rĕphāīm*). 1. A popular name of the prehistoric inhabitants of Palestine, especially to the east of the Arabah (q.v.). The Hebrew *rūphā* means weak, and hence is used of the shades of the dead (e.g., Isa. xiv. 9). It has, therefore, been supposed by some scholars that the term is applied to the early legendary inhabitants, whose ghosts were thought still to haunt their ancient homes and who were magnified into giants. In this sense the word may be used in 2 Sam. xxi. 16 et seq. Most definite are the interesting antiquarian notes in Deut. ii. 10, 20, where reference is made to the predecessors of Moab and Ammon and they are described as a gigantic folk; cf. the tradition concerning the Anakim, whom Israel encountered in south Palestine (Num. xiii. 33). In Deut. iii. 11 Og, the King of Bashan, is recorded as a descendant of this gigantic race, and the proof of his stature is given in an enormous bedstead of iron. It is not impossible, however, that there was an ancient people called Rephaim and that a reference to them belonged to the historical nucleus preserved in Gen. xiv. Consult Driver, *Commentary on Deuteronomy*, p. 40 (London, 1895). 2. The valley of Rephaim, the scene of the two battles in which David broke the power of the Philistines (2 Sam. v. 18, 22, xxiii. 13; 1 Chron. xiv. 9 et seq.); also famous for fertility (Isa. xvii. 5). The location is given in Josh. xv. 8, 9, xviii. 16, as contiguous to the valley of Hinnom, and it is identified with the broad valley running for 2 miles southwest from Jerusalem, a strategic vantage point for the invaders and also affording coöperation with the non-Israelitish city of Jerusalem.

REPH′IDIM (Heb. *Rĕphīdīm*, probably refreshments, from *rāphad*, to support, succor). A station in the route of Israel to Sinai (Ex. xvii. 1, 8, xix. 2; Num. xxxiii. 14 et seq.). It was the scene of a rebellion of the people for lack of water, which Moses supplied by a miracle, whence, according to tradition, the names Massah (tempting) and Meribah (striving) were given to the place. Here Israel routed Amalek by miraculous interposition, an account of which was recorded in writing. Here Jethro, Moses's father-in-law, paid him a visit. But, as in the case of most of the stations, no local tradition of the name survives, and we have no means at present of determining where Rephidim was located. The identification with the oasis of Feiran goes back to Eusebius. See Sinai.

REPIN, ryā′pĭn, Ilia Yefimovitch (1844–). A Russian historical, genre, and portrait painter, born at Tchuguyev in the Government of Kharkov. The son of a poor Cossack officer, he was first instructed by an obscure painter in his native place, and soon earned a living by painting saints' images until enabled, in 1865, to go to St. Petersburg, where he studied first under Ivan Kramskoy (1837–87), the leader of the new naturalistic movement, and then at the Academy. In 1870 his "Raising of Jairus's Daughter" brought him the great gold medal and a traveling scholarship. Before leaving Russia he painted and in 1873 exhibited in Vienna and St. Petersburg the "Burlaki" (Bargemen on the Towpath) (Tretiakov Gallery, Moscow), the first masterpiece of modern Russian painting. His best picture dating from his foreign sojourn was "Szadko in the Wondrous Realm of the Sea" (Alexander III Museum, St. Petersburg), based upon a national legend. For this he was elected a member of the Academy (1876). After his return home he joined the Society of Traveling Exhibitions, which represented the reaction against classic traditions. He settled first in Moscow and then in St. Petersburg, where he became professor at the reorganized academy and strongly influenced the younger generation. Repin's art is distinctly national; in his series of great historical and naturalistic compositions he has interpreted the soul of Russia. Among the best known are: "The Czarevna Sofia at the Chapel Window" (1879), "Back from Siberia" (1884), "The Arrest" (1880–89), "The Religious Procession" (1883), "The Duel" (1897), "Gogol Burning his Manuscripts" (1909), and "The Cossack's Reply to Sultan Mahommed IV," all in the Tretiakov Gallery, Moscow; "Ivan the Terrible and his Slain Son" (1885), and "St. Nicholas Staying an Execution" (1889), both in the Alexander Museum at St. Petersburg. After 1886 Repin devoted himself largely to portraiture, his subjects including Liszt, Rubinstein, Garshin, Pissemski, Tolstoy, and all the eminent men of Russia. Characteristic of Repin's earlier work is the element of gloom and oppressiveness. He interpreted what he saw of the dumb, patient suffering around him, and, like Tolstoy, had the profoundest compassion for humanity. A happier atmosphere pervades some of his later pictures, and all his works exhibit great power and freedom of treatment, robust, opulent color, and truthful presentation. A humorous note, unusual in this artist, is sounded in the "Holiday Evening in Little Russia" (1881) and "Country Life in the Crimea" (1888). The Tretiakov Gallery in Moscow preserves more than 50 of his paintings. Mention must also be made of his brillant water colors, etchings, and busts, and of his illustrations for Tolstoy, Gogol, and other writers. Consult: J. Norden, *Ilja Jefimowitsch Repin* (Vienna, 1894); Richard Muther, *A History of Modern Painting* (rev. ed., New York, 1907); Christian Brinton, *Modern Artists* (ib., 1908).

REPLEV′IN (OF. *replevin*, from *replevir*, from ML. *replivire*, to warrant, pledge, from *re-*, back again, anew + *plevire, plegiare*, to pledge). An action brought to recover the possession of goods and chattels unlawfully taken or wrongfully detained. Under the old common-law practice it was only employed to recover back goods which had been unlawfully taken from the owner, as by the ancient proceeding of distress for rent, and detinue was used for the recovery of chattels unlawfully detained. Today by statute in most jurisdictions replevin, or some action of like nature, is employed for the recovery of chattels wrongfully withheld, however the wrongful possession may have been obtained. In the action a writ is issued for the seizure of the goods, and the plaintiff is required to file a sufficient bond to cover damages which may result to the defendant. In some states the defendant may give a bond and retain possession until the action is determined. Any person who is entitled to the possession of property may maintain the action, and the defendant must rely on the strength of his own rights rather than on the weakness of the plaintiff's title. The plaintiff should allege in his complaint or declaration the value of the chattels and what damage he has sustained, and in such case is entitled to an alternative verdict and judgment commanding the return of the goods, or if that is not possible, the payment of their value, and in each case damages for their detention. The defendant must return the goods if possible, and he does not have the option of paying their assessed value instead. If the defendant is successful he is entitled to recover such damages as he has sustained, and may sue on the plaintiff's bond. Replevin is a possessory action and corresponds to ejectment (q.v.) as to real estate. See CHATTEL; DETINUE; PROPERTY; TROVER.

REP′LICA. See COPY.

REPORT′. In law, the written or printed account of a case which has been judicially determined. Such an account, in the most complete and accurate reports, is usually composed of a brief statement of the facts of the case prepared by the reporter, a brief summary of the arguments of counsel, including a statement of the principal authorities cited by them on the argument, and the opinion of the court. The opinion also frequently contains a statement of the facts, a statement of the court's decision of the case, and the reasoning and the authorities upon which the decision is based. The report of the case may also include dissenting opinions. The value and use of precedents in the English common law (see PRECEDENT) make the careful preparation and preservation of reports of decided cases of the highest importance. Beginning with the reports of cases contained in the yearbooks (Edward II to Henry VIII) there is a complete series of reports of cases decided in the higher English courts down to the present time. In each of the United States there are published reports of all cases decided by the courts having appellate jurisdiction, going back to the date of their organization; and there are also complete reports of the cases decided in the United States Supreme Court and the inferior Federal courts having appellate jurisdiction since their creation under the United States Constitution.

The yearbooks were prepared at public expense by scribes of court or reporters who were appointed to that duty, a function which unfortunately was abandoned at the close of the reign of Henry VIII. After that time the reports were the work of private lawyers, and they sometimes bear evidences of hasty and inaccurate preparation. Some of them, however, prepared by lawyers of great learning, are of the highest value as authorities. The first chancery reports were published after the Restoration, although West's *Symboleography*, published in the latter part of the reign of Elizabeth, contained some precedents of process, bills, and answers in chancery.

In the United States generally reports of cases are now published by public officials appointed for that purpose by the court, and in those States in which the law and equity systems have been merged, law and equity cases are published together. The increase in volume of litigation has resulted in recent years in an enormous increase in the number of reports and has led to the consideration of various plans for curtailing their number.

Consult W. T. S. Daniel, *History of the Origin of the Law Reports* (London, 1884), and Eugene Wambaugh, *Study of Cases* (2d ed., Boston, 1894). For a complete list of reports, see C. C. Soule, *Lawyers' Reference Manual of Law Books and Citations* (Boston, 1884).

REPOUSSÉ, re-pōō′sā′ (Fr., beaten back). A process of ornamenting thin metal by producing a pattern or design with a hammer. The finest existing specimens of this work are those of Benvenuto Cellini (q.v.), made in the sixteenth century. The art was extensively practiced by the early Egyptians and Etruscans.

In repoussé work special tools are employed, among them a hammer with an elastic handle screwed to a permanent support. Many adjustable heads are provided to suit the different parts of the work. After the pattern is roughly hammered up from the inside, the design is perfected on the outside with chasing tools. In order to make this possible a bed of some soft but resisting material is used to furnish a support for the thin, pliant metal. If the work is a hollow vessel it may be filled with melted pitch, which is permitted to harden.

This art is most successfully applied to such malleable metals as gold, silver, copper, tin, and lead. A similar effect, though lacking in artistic merit and in individuality, is produced by stamping with dies. See DIES AND DIE SINKING; EMBOSSING.

REPPLIER, rĕp′lēr, AGNES (1855–). An American essayist of French descent, born in Philadelphia, Pa., April 1, 1855. Miss Repplier was educated at the convent of the Sacred Heart at Torresdale, Pa. She is known for her travels and for many articles in such magazines as *Scribner's* and the *Atlantic Monthly.* Her lively essay style often deals with serious subjects in a vein of light, humorous banter sometimes tinged with irony. In 1902 the University of Pennsylvania conferred on her the degree of Litt.D. She lectured at Randolph-Macon Woman's College in 1915. Her published volumes include: *Books and Men* (1888); *Points of View* (1891); *Essays in Miniature* (1892); a *Book of Famous Verse* (edited, 1892); *Essays in Idleness* (1893), perhaps her most popular work; *In the Dozy Hours, and Other Papers* (1894); *Varia* (1897); *Philadelphia: The Place and the People* (1898); *The Fireside Sphinx* (1901); *Compromises* (1904); *In our Convent Days* (1905); *A Happy Half Century* (1908); *Americans and Others* (1912); *The Cat* (1912), an anthology of prose and verse on the subject indicated.

REP'RESENTA'TION (Lat. *repræsentatio;* from *repræsentare,* to represent, from *re-*, back again, anew + *præsentare,* to present, from *præsens,* present, pres. p. of *præesse,* to be at hand, to be before, from *præ,* before + *esse,* to be). In political science, the agency through which the collective will of the people is exercised. In the city states of Greece and Italy, where pure democracies prevailed, all the citizens, in theory at least, attended the public assemblies. The comparatively small geographical area of the city state and the relatively small number of persons vested with the full rights of citizenship made it possible to govern without resort to the agency of representation. Besides, government was a simple matter then as compared with the government of a modern community, and hence the body of citizens meeting at intervals could without difficulty frame the few police regulations that were necessary and administer justice among the inhabitants. The agency of representation was first extensively employed by the Church in the ecumenical councils which it called from time to time, and this may have led to its more general employment for purposes of civil government. The idea of political representation, like many other political institutions, was a contribution of the Teutonic nations, by whom it was employed in a rude way in their popular assemblies. The first European legislature founded on the principle of representation was the Parliament of England. (See PARLIAMENT.) In 1302 Philip the Fair, King of France, summoned representatives of the three estates, nobility, clergy, and commons, to form the States-General (q.v.). In Aragon the Cortes (q.v.) acquired a very important share in the government and grew to be powerful enough to impose its will upon the monarch. In other countries of Europe about the same time national representative bodies were summoned by royal authority. The mediæval idea of representation was representation of classes and interests rather than of numbers, which is the basis of the modern idea. Each order had its own representatives, who sat apart and carried on their work independently, one class thus being able to neutralize the action of the others. A distinction was made in England between rural and urban constituencies, each having its own representatives, and this still prevails.

As regards the relation of the representative to his constituency, a popular view is that the representative is the mouthpiece of his constituency and subject to their instructions. According to this view he has no independent judgment and cannot follow the convictions which he may have reached from the most exhaustive study and reflection, if the will of his constituency be otherwise. Moreover, their own local interests are to be preferred to those of the country at large, and it is his first and foremost duty to champion those interests in preference to the national interests. A sounder view regards the representative as the interpreter of the common consciousness of right and reason. According to this view the representative is not bound by the will of his constituency, but by research and reason endeavors to discover what the general good requires. The question has been much discussed as to whether a system of representation based on mere numbers is an ideal one or even a just one. By many it is contended that an equitable system of representation would take into consideration various interests, economic, industrial, social, and religious as well as political. They insist that provision should be made for special representation of such classes as free traders, single-tax adherents, labor organizations, civic federations, business leagues, chambers of commerce, the advocates of temperance and prohibition, Socialists, etc. The tremendous tendency towards class differentiation and the growing popularity of independent movements in politics, it is said, make a reform of the present system of representation highly desirable so as to harmonize conflicting interests, to enable each class to show the people what its interests are, and to defend them against attack.

By the present system the political party having a minority of voters in a given electoral district is generally unrepresented in the government, notwithstanding the fact that its numerical strength may lack but a few votes of equaling the party which secures the entire representation. As a result of this system it frequently happens that the minority party in a State is inadequately represented in the State Legislature or in Congress. To remedy these inequalities various methods have been proposed and in some cases attempted. Of the more important of these the first to be mentioned is the so-called limited vote, according to which each voter in an electoral area is allowed to vote for a certain number of the candidates, usually one less than the number to be elected, so that if three members are to be elected from the district the minority is reasonably sure of electing one member. This method may be employed only in elections in which three or more representatives are to be chosen from the district. The chief objection to this method is that it does not allow the minority party proportional representation but only limited representation. Moreover, it allows representation only to a very large minority and makes no provision for third parties and independent movements. Another method is the so-called cumulative vote, which allows the elector as many votes as there are representatives to be chosen from the district and which permits him to distribute them among the different candidates as he pleases or to cumulate them on one or more candidates. The advantage of this method over the first mentioned is that it enables a small minority to elect at least one member by cumulating their votes. Since 1870 it has been employed in Illinois for the election of representatives in the Legislature. The chief objection to this method is that it frequently involves a waste of votes, since a popular candidate may receive many more votes than actually necessary to elect him. As a result of this it may happen that the minority party actually succeeds in electing two representatives out of three.

What is known as the Hare or Andræ system, so called because proposed by an Englishman named Hare and introduced into Denmark by Andræ, provides for the election of representatives by general ticket and allows each elector to vote for one candidate or for a limited number, but permits him to indicate his second and third choices, etc. The total number of votes cast is divided by the number of representatives to be chosen, and the quotient is taken as the amount necessary to elect any candidate. In counting the ballots only the first choices are counted, and as soon as a candidate has received a number of votes equal to the electoral quotient he is declared elected and no more votes are counted for him. The remaining ballots which designate him as first choice are then counted for the candidate having second choice, and so on down the list until the necessary number of persons have been declared elected. Under this system the waste of votes is insignificant, but its complexity is an objection, and the element of chance enters into the scheme. Finally there is the free-list system, according to which a certain number of voters may nominate a number of candidates not exceeding the number of places to be filled. Each voter casts as many votes as there are representatives to be chosen, distributing them at will but not cumulating them on any one candidate. The number of votes necessary to elect is determined by dividing the total vote cast by the number of places to be filled. The total vote cast by each party is then divided by the electoral quotient, and the result is the number of representatives to which each party is entitled. Any deficiency is supplied from those parties having the largest fractional quotas. This plan possesses the advantage of economy and secures proportional representation. Consult: F. P. G. Guizot, *History of the Origin of Representative Government in Europe* (London, 1861); H. J. S. Maine, *Popular Government* (2d ed., ib., 1886); A. P. C. Griffin (comp.), *List of Books . . . Relating to Proportional Representation*, published by the United States Library of Congress (Washington, 1904); J. S. Mill, *Considerations on Representative Government* (People's ed., London, 1911).

REPRESENTATION. In law, a statement or assertion as to some matter of fact. Representations have significance in a legal sense when they are acted upon. Such representations may be made as the basis of numerous legal transactions. See CAVEAT EMPTOR; CONDITION; DECEIT; FRAUD; SALE; WARRANTY; ETC.

In the law of inheritance the term "representation" is also used to denote the principle upon which the issue of a deceased person take or inherit the share of an estate which their immediate ancestor would have inherited had he been living. Thus, if one dies intestate, leaving two children and the children of a deceased child surviving him, the children will each inherit one-third of the real estate of the deceased and the other third will go to the children of the deceased child, who are said to take by representation. See ADMINISTRATION; HEIR; INHERITANCE.

REP′RESENT′ATIVES, HOUSE OF. The lower house of the Congress of the United States. See COMMITTEE; CONGRESS; UNITED STATES.

REPRESENTATIVES, LEGAL. See LEGAL REPRESENTATIVES.

REPRIEVE, rē-prēv′ (doublet of *reprove*, from OF. *reprover*, Fr. *réprouver*, to reprove, reject, from Lat. *reprobare*, to condemn, reject, from *re-*, back again, anew + *probare*, to test, prove, from *probus*, good). The temporary suspension of a sentence for a crime, granted by the pardoning power, which is usually the chief magistrate of a state or nation. The term is most commonly employed to denote a stay of execution of a person convicted of a capital crime. Reprieves are usually granted in order to allow an investigation into the legality of the conviction, or into alleged newly discovered evidence in favor of the condemned person. They are granted also in case of pregnancy of a woman condemned to death, in cases of alleged insanity after condemnation to death, and often pending an investigation of facts urged in an application for a pardon. See PARDON.

REPRISAL, rē-prīz′al (OF. *represaille*, Fr. *représaille*, from *reprise*, prize, a taking, from *repris*, p.p. of *reprendre*, to retake, from Lat. *reprehendere, reprendere*, to recover, blame, from *re-*, back again, anew + *prehendere, prendere*, to take). In international law, a means of securing redress without resort to war but at the same time with the use of force. It consists in forcibly seizing from an offending nation property or its equivalent belonging to the aggrieved nation or in detaining the property of an adversary with the intention of compelling it to afford the necessary redress. Reprisal is resorted to when a specific wrong has been committed, and the seizure is by way of compensation in value for the wrong. The things seized are held subject to the termination of the controversy, and are restored if the controversy is amicably settled. Reprisal is an act of retaliation and consists in applying to the subjects of an offending state treatment analogous to that which the subjects of the offended state have received. A reprisal, though an act of war in fact, is not such in intent, and, indeed, is resorted to as a means of avoiding war by securing redress without resort to the graver alternative, although it may constitute a sufficient cause of war. The forms of reprisal most commonly employed in recent times consist in placing an embargo on such ships of the offending state as may be lying in the harbors of the aggrieved state or in the seizure of its ships at sea or of any property within the jurisdiction of the state, whether belonging to the state or to private citizens. See INTERNATIONAL LAW, *Measures Short of War;* RETORSION.

RE′PRODUC′TION (from Lat. *re-*, back again, anew + *producere*, to produce, from *pro*, before + *ducere*, to lead). The fundamental property of the organic world essential in repairing losses by death and in maintaining the earth's population. Although at the outset the result of unknown causes, it consists in a separation of a part of the body of an individual from the parent body, division of a one-celled organism into two, or a giving off of an egg cell or sperm cell from the parent. (See CELL; MITOSIS.) Reproduction and growth are inseparable, and the former is the result of growth. As Verworn states, the general process that constitutes growth is an increase of living substance, and the essence of reproduction likewise consists merely in an increase of living substance. Reproduction differs from growth in that a part of the substance separates from the original organism. If the quantity of the living substance increases further by growth, this results in a "growth beyond the measure of the individual," and the cell must divide, i.e., reproduce. The different forms of reproduction are: (1) self-division, secondary forms of which are (*a*) fission and (*b*) budding or gemmation; (2) conjugation; (3) sexual reproduction.

Reproduction by Cell Division. This is the primary mode of reproduction. While that of plant and animal cells is called cell division, that of the entire one-celled plant or animal is called self-division. This has been observed in the amœba and other Protozoa, as well as in the white corpuscles of the blood (leucocytes). See AMŒBA.

Fission. Many of the lower invertebrate animals multiply by fission or by budding. In fission the body, as in certain planarian and annelid worms, after having reached a certain size but not sexual maturity by ordinary cell division, is constricted into two or more parts. Each of these several parts separates and regenerates itself into an independent perfect worm. Fission or self-division occurs in fully grown examples of many-celled animals, as in certain polyps and starfish. See cut in article AMŒBA.

Budding or Gemmation. The process of reproducing the persons of a compound individual or colony. Buds are outgrowths of a parent person that enlarge while in connection with the parent to form a new person. In the case of budding the products are unequal. All the higher plants are produced by budding and are colonies. Among animals the process occurs in Protozoa, sponges, cœlenterates, polyzoans, and tunicates. According to one view the tapeworm is a colony whose parts are produced by budding; even segments or rings of an annelid have been considered as produced by budding. Indeed, as there is no sharp line drawn between growth of the simple individual and growth of a compound individual, so no sharp line exists between ordinary development and budding; nor is there any definite distinction between cell division and division in the amœba and budding. This is seen in examples of terminal budding, when the buds appear at the end of the main axis of the parent organism, as in plants and certain Protozoa and low multicellular animals.

Conjugation. Though an anticipation of sexual reproduction, conjugation radically differs from it in the fact that two conjugating bodies are each an entire plant or animal. It occurs in the unicellular plants, such as diatoms and desmids, and in the Infusoria. Thus, in the act of conjugation of a monad-like form (*Heteromita*) a free-swimming individual approaches an anchored form, the posterior ends coming in contact; they then fuse like two drops of sirup, the nuclei sharing in the fusion. The product swims around freely, then rests, loses its flagella, and becomes encysted, then bursts open at three angles of the cyst, pouring out a swarm of spores as the result of multiple internal fission. It is usually among the Infusoria a temporary process, but in *Vorticella* the fusion is permanent. The result of conjugation upon the species is to prevent its deterioration. It is a process of rejuvenation, comparable with the intercrossing of higher plants and animals.

Sexual Reproduction. In the process, sometimes called amphigony, of reproduction by means of sexual cells, two animals, the male and the female, secrete in reproductive glands, one eggs, the other spermatozoa, the result being their union and the formation of a new individual. Here still more than in conjugation sexual reproduction results in a complete renewal or rejuvenescence of the organism. In those plants and animals which also reproduce by budding sexual reproduction arrests degeneration by the introduction of new blood. Sexual reproduction in animals is essentially the same in all classes above the Protozoa. There is a series of developmental processes embraced under the following heads: (1) Maturation of the egg; (2) the process of fertilization; (3) a process of cleavage or segmentation of the yolk (see MITOSIS); (4) formation of the three germ layers. (See EMBRYOLOGY.) The essential phenomenon in the reproduction of the many-celled animals, i.e., all above the Protozoa, is the act of fertilization or impregnation of the egg. This is effected by the entrance of a single spermatozoön into the egg. After the spermatozoön has entered the egg the head and middle portion, which contains the body called the centrosome, can still be recognized as the chromatic and achromatic parts of the spermatozoön or sperm nucleus (male pronucleus). In the protoplasm of the egg (that enveloping the nucleus and called cytoplasm) the centrosome of the sperm nucleus gives rise to rays forming asters. (See MITOSIS.) Preceded by these rays, the sperm nucleus travels towards the egg nucleus until it reaches and fuses with it to form a single cleavage nucleus. Then the centrosome divides into two, which migrate to opposite poles of the nucleus, while the cleavage nucleus changes to a cleavage spindle, which divides and thus initiates the embryonic development, the process being called cleavage or segmentation. At this point fertilization is complete (Hertwig). It also appears that of the chromatin particles (chromosomes) in the newly formed nucleus of the fertilized egg, exactly one-half of the number are furnished by the egg nucleus and the other half by the sperm nucleus. These chromosomes are regarded as the bearers of heredity, forming the physical basis of heredity. See HEREDITY.

Asexual and Unusual Modes of Reproduction. Budding and its various forms are examples of asexual reproduction. In certain insects and other animals the egg develops and gives rise to a mature individual without fertilization. (See ALTERNATION OF GENERATIONS; PARTHENOGENESIS.) Hertwig calls this sexual reproduction with degenerated fertilization. Different modes of reproduction (asexual, sexual, parthenogenesis, pædogenesis) may occur in the same species. The alternation of parthenogenesis with pronounced sexual reproduction is called alternation of generations, or heterogony.

Consult: E. B. Wilson, *The Cell in Development and Inheritance* (2d ed., New York, 1900); Oscar Hertwig, *Zoölogy* (ib., 1902); id., *The*

Cell: Outlines of General Anatomy and Physiology, English translation by M. Campbell (ib., 1909); M. M. Hartog, *Problems of Life and Reproduction* (ib., 1913). See Biology; Bird.

REPRODUCTION, in Plants. Three methods of reproduction are recognized in plants, appearing in succession in the evolution of plants, viz., vegetative multiplication, reproduction by spores, and sexual reproduction.

Vegetative Multiplication. In the simplest plants the body consists of a single vegetative cell, and the division of this cell results in two new individuals. In the most primitive plants this is the only method of reproduction. In the more complex (many-celled) plants cell division usually results in growth rather than in the production of new individuals (reproduction). In such plants, however, the power of vegetative multiplication continues, as when new potato plants come from tubers, new grapevines from cuttings, new begonias from pieces of a leaf, etc. In fact vegetative multiplication is conspicuous in most plants, enabling them to spread with comparative rapidity, as a strawberry spreads by means of its runners or the couch grass by its underground stems. The significance of vegetative multiplication is that ordinary (vegetative) cells rather than special reproductive cells produce new plants.

Reproduction by Spores. In general spores are produced by many-celled plants and are cells (protoplasts) freed from one plant and capable of producing another one. Their chief feature is their separation from the parent plant, so that cell division results in a new individual. When special spore-producing cells or organs appear, from which spores are discharged, they are called sporangia. In many cases, notably among the algæ, spores are provided with cilia and can swim freely in water; in other cases they are light and dry and are carried by currents of air. After its introduction spore production continues throughout the plant kingdom; e.g., the pollen grains of flowering plants are spores. See Spore.

Sexual Reproduction. This was the last method of reproduction to appear among plants and is characterized by the fusion of two sexual cells (gametes) to form a reproductive cell (zygote). It seems clear that gametes are derived from spores, but they behave very differently. At the first appearance of sex the pairing gametes are alike in appearance and behavior, and the fusing process has been called conjugation and the zygote a zygospore. When the gametes become differentiated into sperm and egg, the fusing process is called fertilization and the zygote an oöspore or a fertilized egg. There is no real distinction, however, either in the process or the result in the two cases.

It is evident that in all the higher plants the three methods of reproduction coexist and are used under varying conditions in producing new plants. Consult any general text on the morphology of plants. For a special discussion of reproduction in plants, consult J. M. Coulter, *Evolution of Sex in Plants* (Chicago, 1914). See Apogamy; Apospory; Pollination.

REPRODUCTION OF IDEAS. A term which, in the psychology of associationism, signified the literal reproduction or reappearance of ideas through the force of association. (See Association of Ideas.) The term is misleading, as it implies that mental processes exist and maintain their identity while absent from consciousness, and leads to the supposition of an unconscious or subconscious mind whose observation is a priori impossible. Introspection has taught us that the supposedly reproduced idea is not a copy and often does not contain even the salient structural features of its original. The original idea, e.g., may be primarily visual in character, while the corresponding reproduced idea is an auditory-kinæsthetic complex, or a conscious attitude, or merely a physiological tendency or readiness which serves as its meaning equivalent. (See Thought.) Modern psychology, therefore, prefers to regard retention (q.v.) as a physiological (not a mental) function, and recognizes that reproduction, in the sense of structural reappearance, is never more than approximately realized.

If reproduction is taken in the sense of recurrence of meaning, its conditions may be said to have been intensively studied. (See Imagination; Memory.) Establishment and persistence of associative tendencies appear to be essential, although certain authorities attribute the haunting recurrence of melodies and like phenomena to the activity of perseverative tendencies without involvement of association. In any case the conditions of association and retention may be considered to be also conditions of reproduction. Reproduction further depends upon the presence of a cue (an actively associating meaning) and upon a more or less suitable determination. (See Determining Tendency.) It is primarily due to the lack of these factors, e.g., that in the waking life we so often fail to recall our dreams. Furthermore, reproduction is facilitated by the convergence of associative tendencies upon a single idea and is partially or entirely inhibited by their divergence from the cue. We may recall through the activity of a large number of weak tendencies, although any single one would not lead to reproduction; or we may remain speechless, not because of the lack of associations, but because of their very multiplicity.

Consult J. Ward, in *Mind*, n. s., vols. ii–iii (London, 1893–94), and F. H. Bradley, *Principles of Logic* (New York, 1905). See Association of Ideas; Imagination; Memory; Retention. For reproduction as an experimental method, see Memory.

RE′PRODUC′TIVE SYSTEM, Comparative Anatomy of. The germ cells are not the only ones that are capable of increasing their numbers. This is a common property of all body-tissue cells, and by virtue of this fact the number of individuals may be increased by division of the body and subsequent regeneration (q.v.). In *Infusoria* no specialized reproductive organs are present. When the unicellular organism exceeds its size limit it divides into two parts or daughter cells. (See Fission; Reproduction.) Reproduction of sponges is either asexual or sexual. Asexual reproduction, or budding, may occur externally or internally. The sexual reproduction may be hermaphroditic or diœcious. *Cœlenterates* are, for the most part, sexually separate, but some are hermaphrodites, as Ctenophora. There are no organs for the transmission of the sexual products to the exterior.

Sexual ducts occur for the first time in *flatworms.* In some the entire ovary produces eggs, while in other forms only a part of the ovarian cell produces egg cells and the rest, the vitellaria, is so modified that it produces only yolk. Both the female and the male glands communicate with the exterior by ducts leading to the copulatory apparatus. The sexes are almost always separate in echinoderms. In one group (Synapta) of the holothurians hermaphroditism is frequent. There are no copulatory organs nor accessory glands. The general organs of starfishes develop in five pairs of bundles. One pair lies in each arm, and each pair opens dorsally to the exterior by a separate opening.

In the *mollusks* the generative apparatus is composed of germ glands, ducts, and copulatory organs. The sexes are separate throughout the whole phylum. Hermaphroditism is, however, widespread. In nearly all cases of hermaphroditism both kinds of sexual products are produced in the same gland. The gonads either have separate ducts or utilize the nephridia. The genital glands open either (1) into the pericardium, (2) into some part of the kidney or uterus, (3) into the cloaca, or (4) directly to the exterior. When there are separate ducts they may be very complicated in structure. The structure of the copulatory organ and the form of the ducts with their accessory glands and tubules vary much in detail in the different species. The sexes are distinct in many of the annelids, but Hirudinea, Oligochæta, and some others are exceptions. The sexes of Polychæta are separate with a very few exceptions. The ovaries or testes are segmentally repeated several or many times. The ripe eggs and sperm float in the cœlomic cavity, to be picked up and discharged to the exterior by the nephridia, or by nephridia specially modified into genital ducts.

The sexes are separate in *Crustaceæ* except in a few cases. The male and the female sexual glands are constructed on the same plan and have a similar position in the body. There is only one pair, and in certain species only one gland. The parts that make up the sexual apparatus are as follows: (1) the genital organs (ovaries and testes); (2) ducts (oviducts, vasa deferentia); (3) terminal parts (vulva, vagina, and receptaculum seminis in the female and ductus ejaculatorus in the male); (4) outer copulatory organs. Except in Cladocera and some Copepoda the genital apertures are situated on the ventral side. In all hexapods they open at the end of the abdomen. In certain species there are glands whose secretion unites the sperm cells into capsules or spermatophores. A penis may also be present. The female apparatus may possess a receptacle for the penis and another for storing the sperm. The testes and ovaries consist of a varying number of long tubes which together enter the vas deferens or oviduct. The ovarian tubes are of two kinds, those with and those without nutritive cells. The nutritive cells may alternate with the egg cells or they may be collected in a bunch and furnish nutritive material to the egg cells by means of fine constricting strands. Coming to the Chordata, we find that in *Balanoglossus* the sexes are separate, and the ovaries and testes are a row of sacular organs which open to the exterior by a series of pores or, in the American species, by rupture. Tunicates are hermaphroditic.

In *Amphioxus* the sexes are separate. The sexual organs are horseshoe-shaped sacs which lie in 26 pairs and without ducts. The ova and spermatozoa burst the atrial cavity and reach the exterior by means of the atropore. The sexes of the lamprey are separate and the sexual organ is unpaired. The sexual products pass into the body cavity and thence to the exterior by two pores into the urinogenital sinus. There is a penis in the male.

In *fishes* impregnation is internal in all the sharks except the Greenland shark. The claspers act as intromittent organs. With a few exceptions, such as the dogfish, there are two ovaries and the oviducts are separate from the ovaries. The oviducts, the Müllerian ducts, are united anteriorly and open into the body cavity. The eggs are extruded into the body cavity and then pass into the oviducts. There is a large shell gland in the oviduct. The majority of fishes lay eggs that are fertilized outside the body. Most sharks and a few teleosts are viviparous, the eggs being hatched in the oviduct or ovary. In two of the sharks the yolk sac and the wall of the oviduct are united, suggesting the placenta of mammals. The ovaries of teleosts are continued backward into a duct. Posteriorly the two ducts fuse. The oviducts of the Dipnoi are somewhat coiled, like those found in Amphibia; each connects with the body cavity near the pericardium by means of a funnel-shaped aperture. Hermaphroditism is not uncommon throughout the Teleostei.

Reptiles and Birds.—The ovaries are broad in the turtles and long and narrow in snakes and elongated lizards. The ovaries are usually asymmetrical. Only the left ovary is completely developed in birds. The oviducts open into the abdominal cavity by wide funnel-shaped apertures, and in the walls of the ducts are glands for the formation of albumen and eggshells. The ovaries, like the testes, increase in size during the breeding season. In birds the vas deferens, like the ovaries, opens into the cloaca by an independent aperture. In lizards it fuses with the ureter. There is a copulatory organ in reptiles; in birds it exists only in the ducks, geese, and Ratitæ.

The genital apparatus of *mammals* lies in the lumbar and pelvic regions. When the ova are mature they pass into the body cavity or are immediately caught up by the funnel-shaped opening of the oviducts. This portion is known as the Fallopian tubes. In the majority of mammals the oviducts fuse behind the Fallopian tubes to form the uterus. It is in the uterus that the ova attach themselves to the maternal tissue and develop. The fused region behind the uterus is known as the vagina. In monotremes the Müllerian duct remains distinct and there is a cloaca. In marsupials the Müllerian duct begins to fuse to form a vagina. In most other mammals an anterior fusion of the two parts of the uterus occurs. The degree of fusion varies in different species. In Primates the only evidence of the paired origin is seen in the Fallopian tubes. The testes of mammals develop in the same position as the ovaries, but they later pass out of the abdominal cavity through an opening in the latter known as the inguinal canal and descend into the scrotal sacs; but in many mammals the testes remain permanently in the abdomen.

External genital apparatus exists as follows: In elasmobranchs there are male claspers which are inserted into the cloaca and oviduct of the female. In connection with them there is a gland which is histologically much like the uropygial glands of birds. In Amphibia the male of *Gymnophiona* alone possesses an eversible cloaca. In lizards and snakes there are two erectile penes outside the cloaca. Each is furrowed. Organs of similar nature, but much less developed, occur in the female. Chelonians and crocodiles have a copulatory organ united with the ventral wall of the cloaca. It is made up of two fibrous fused masses and, as in the above copulatory organs, is regulated by well-developed muscles. There is a furrow on its surface. The female also has a median, less well developed organ of the same character. In most Ratitæ and some Carinatæ there is an eversible tube strengthened by two fibrous bodies. When at rest it is coiled up in the left side of the cloaca. The copulatory organ of monotremes lies between the urinogenital sinus and the cloaca and is fused with the ventral wall of the latter. In all other mammals the organ arises on the ventral wall of the cloaca. In the female it is channeled. In the male the groove is closed to form a canal. Three bodies of erectile tissue are developed in connection with the penis of man. The greater part of one of these glands occurs at the apex of the penis and is known as the glans penis. The clitoris of the female is the homologue of the male penis.

Consult: Arnold Lang, *Text-Book of Comparative Anatomy*, English translation by H. M. and Matilda Bernard (2 vols., New York, 1891–96); R. E. E. Wiedersheim, *Comparative Anatomy of Vertebrates*, English translation by W. N. Parker (3d ed., ib., 1907); Parker and Haswell, *Text-Book of Zoölogy* (ib., 1910).

REPTILE, rĕp′tĭl *or, in Brit. usage,* rĕp′tīl (Lat. *reptile*, neut. sing., sc. *animal*, animal, from *reptilis*, crawling, from *repere*, to crawl; connected with *serpere*, Gk. ἕρπειν, *herpein*, Skt. *sarp*, to creep). A cold-blooded vertebrate animal of the class Reptilia, breathing by lungs and having a single median occipital condyle. In their larger, phylogenetic relationships reptiles occupy a central position, but are closely in affinity with birds, so that the two classes were united by Huxley into a group, Sauropsida, in distinction from the Mammalia and from the Ichthyopsida, or amphibians and fishes.

Classification. The history of the development of the ideas on the classification of reptiles is given under HERPETOLOGY (q.v.). The arrangement by Parker and Haswell is as follows:

Class REPTILIA:

Order I. Squamata.—This includes the Lacertilia (lizards), Ophidia (serpents), and Pythonomorpha (extinct snake-shaped forms, with paddle-like limbs and lizard-like skulls).

Order II. Rhyncocephalia.—Lizard-like reptiles, often huge, scaly, with walking limbs; vertebræ amphicœlous; sacrum composed of two vertebræ; teeth acrodont. This order has one living genus (*Sphenodon*).

Order III. Chelonia.—The turtles (q.v.).

Order IV. Theromorpha.—Sacrum composed of six vertebræ, limbs adapted for walking; four suborders: Anomodontia, Placodontia, Pareiasauria, Theriodontia—all extinct.

Order V. Crocodilia.—Crocodiles and alligators.

Order VI. Sauropterygia.—Extinct aquatic reptiles with a very small head, elongated neck, limbs usually flipper-like, and teeth in separate sockets.

Order VII. Ichthyopterygia.—Extinct aquatic reptiles with large head, no neck, long tail, flipper-like limbs, naked skin, and teeth lodged in a groove.

Order VIII. Dinosauria.—Extinct terrestrial reptiles, skin naked or armored, pelvis birdlike, teeth in sockets. See DINOSAURIA.

Order IX. Pterosauria (pterodactyls).—Extinct aërial reptiles with long neck, sacrum composed of two or three vertebræ, skull birdlike, sternum present, fore limbs winglike, and teeth in sockets.

An advance upon this, resulting from larger knowledge of fossil forms, has been educed by Boulanger and Gadow, so that the most complete classification now stands as follows:

Class REPTILIA:

Subclass I. *Proreptilia.*

Subclass II. *Prosauria.*—Orders: Microsauri, Prosauri.

Subclass III. *Theromorpha.*—Orders: Parciasauria, Theriodontia, Anomodontia, Placodontia.

Subclass IV. *Chelonia.*—Orders: Athecæ, Thecophora.

Subclass V. *Dinosauria.*—Orders: Sauropoda, Theropoda, Orthopoda, Ceratopsia.

Subclass VI. *Crocodilia.*—Orders: Pseudosuchia, Parasuchia, Eusuchia.

Subclass VII. *Plesiosauria.*—Orders: Nothosauri, Plesiosauri.

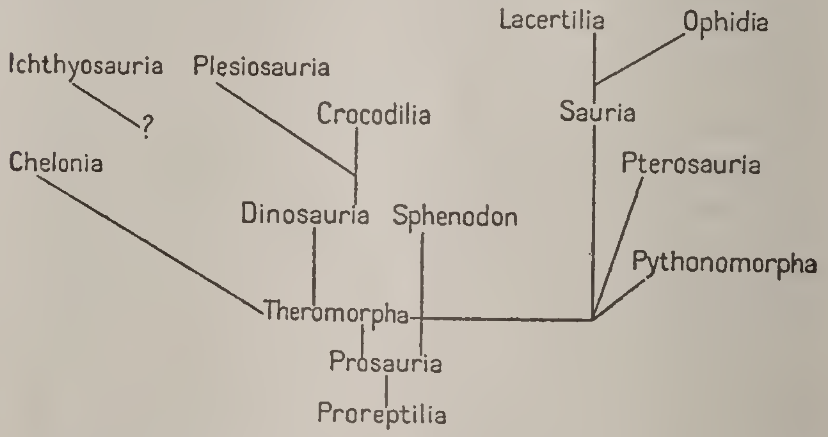
Subclass VIII. *Ichthyosauria.*

Subclass IX. *Pterosauria.*

Subclass X. *Pythonomorpha.*—Orders: Dolichosauri, Mosasauri.

Subclass XI. *Sauria.*—Orders: Lacertilia, Ophidia.

The term "subclass" is given to the larger subdivisions "to emphasize the fact," says Gadow, "that these reptilian groups are of undeniably greater morphological value than those which are generally called 'orders' in the Mammalia." This author tries to display their supposed evolutionary phylogenetic relations by the following scheme:



The earliest fossil reptiles are found in the Permian age. Reptiles attained their highest development in Jurassic and Cretaceous times, when many were of gigantic proportions and ruled the world. Since then the order has waned, only the recent and adaptive line of snakes seeming to flourish and promise continued prosperity at the present time.

Characteristics. With the exception of modern chelonians and ancient dinosaurs, the reptiles in general are of an elongated form, the body being often nearly cylindrical and usually terminating in a very long tail. In a considerable number (as most serpents and some lizards) no traces of limbs are apparent; in some (as certain lizards) the limbs are rudimentary; while in the remainder the limbs are fully developed, although the feet rarely suffice to keep the belly from the ground. The feet are of the pentadactyl type, but not always five-toed.

The covering of the body presents several well-marked varieties. In a few of the lizards the skin is covered with regular scales, composed of a mixture of bony and horny matter and lying over each other like those of fishes; in most lizards and in serpents scales and plates are developed on the surface of the corium or true skin and covered over with epidermis, which is thrown off at intervals, the molt forming an accurate cast of the body of the animal; while in the crocodiles and tortoises the scales are converted into true bony plates, which in the former are embedded in the tissue of the skin and in the latter are united with the ribs, sternum, and other bones of the internal skeleton, to form the complete bony case into which the head and limbs of the animal can usually be retracted. See SKELETON, *Exoskeleton.*

The skeleton is completely ossified in all reptiles. The skull is small, loosely united, and articulates with the atlas, as in birds, by one condyle, which is formed mainly by the basioccipital. There is an auditory columellar apparatus within the fenestra ovalis, as in Amphibia. The mandibles consist of many pieces, and articulate with the cranium through quadrate bones—one of the principal characters separating this class from the mammals.

The mouth, except in the chelonians, is usually provided with conical teeth, adapted rather for seizing and holding prey than for dividing and masticating food. These teeth, like those of fishes, are successional; i.e., new teeth are being constantly developed, while the older ones are regularly shed. (See CROCODILE.) In some instances the teeth are attached solely to the jaws, while in others they are attached also to the pterygoid or palate bones. In chelonians the teeth are replaced by a horny beak, which, according to the habits of the animal, is adapted for bruising as well as cutting and which in some species constitutes a somewhat formidable weapon.

The vertebræ, like those of other Amniota, are gastrocentrous, i.e., their centra "are formed by the pairs of intercentralia, while the basicentralia are reduced" or lost altogether; this characteristic separates reptiles wholly from amphibians. The total number is often great, especially in serpents and the tail of the lizards. The ribs form a true sternum, and the iliosacral connection is postacetabular; the former of these characters separates reptiles from amphibians and the latter from mammals. Reptiles are mainly carnivorous and swallow their prey whole. Hence the jaws are adapted, by their mobility and subdivision into segments, to open very widely, and the œsophagus is capable of great dilatation. The tongue is commonly free, elongated, and bifid, except in the crocodiles, in which it is immovable, whence the popular idea that these animals do not possess this organ. The stomach is sometimes scarcely larger than the œsophagus and intestines (as in serpents), while in other cases it forms a sac of considerable size. In either case it is capable of great dilatation. A liver, pancreas, and spleen are always present, the two former pouring their secretions into the upper part of the intestine, which is short, wide, and not much twisted, and is divided into two portions, corresponding to the small and large intestines of mammals, by a valve. It finally terminates in a wide cloaca, into which the ducts of the urinary and generative organs usually open. The kidneys differ from those of amphibians, and agree with those of birds, in having no nephrostomes and in having each its one separate ureter. See ALIMENTARY SYSTEM, EVOLUTION OF.

Reptiles breathe air only by means of lungs, and never have gills even during embryonic life. The lungs are usually of large size; but as they are not subdivided, as in mammals and birds, into innumerable microscopic air cells, the real aerating surface is comparatively small. In several groups they are merely capacious bags, whose vascular or aërating surface is but slightly increased by sacculi developed in their cells. In serpents one lung (usually the right one) is of extraordinary length, while the other remains altogether rudimentary. This inferiority of the respiratory apparatus of reptiles is further shown in the absence of those means for the continuous introduction and expulsion of air possessed by birds and still more by mammals. See RESPIRATORY SYSTEM, COMPARATIVE ANATOMY OF.

This feeble respiratory system is correlated with the absence of any covering, such as hair or feathers, which might retain the bodily heat generated by the oxygenation of the blood, as is the case in the well-clothed birds and mammals; hence the blood remains at a temperature little above that of the air or water in which these animals live, and reptiles are placed with the similarly naked or scaly amphibians and fishes as poikilothermous or cold-blooded. (See ANIMAL HEAT.) The heart, unlike that of a bird or mammal, is divided into two atria and an imperfectly divided ventricle; it has no conus, but semilunar valves exist at the base of the tripartite aortic trunk; the right and left aortic arches are complete and remain functional. The red corpuscles of the blood are nucleated, biconvex and oval—a point of distinction from mammals.

The brain and nervous system present no peculiarities calling for special remark; the presence of an intercranial hypoglossal nerve separates this class from the Amphibia. The organs of the senses are well developed, but there are no lateral sense organs. No reptiles have external ears, but their hearing is good. See NERVOUS SYSTEM, EVOLUTION OF.

The sexes are always separate, and the male generative organs, which are far more highly developed than in amphibians, present peculiarities which, in association with the position of the anal aperture, have been adopted by zoölogists as a basis of classification of special taxonomic value among the Ophidia. Fertilization is always internal, and most reptiles lay meroblastic eggs, from which the young hatch quickly under the influence of the warmth derived from the hot sand or decaying vegetation in which they are buried by the mother or, in a very few cases, by her incubation. The eggs are comparatively few (except in the turtle tribe) and relatively large, containing a large quantity of food yolk, so that the young are able to take care of themselves the moment they emerge; yet in most cases they receive some parental care. The integument of the eggs is parchment-like, containing little lime, and the color is always white. Certain reptiles, however, retain their ova in a sort of uterine cavity, formed by a dilatation of the oviduct near its termination in the cloaca, until the development of the embryo is so far advanced that the enveloping membrane bursts previously to the expulsion of the ovum, so that the young are actually born alive—a mode of generation to which the term "ovoviviparous" is applied. An amnion and an allantois are formed in the process of development, allying reptiles with birds and mammals. See REPRODUCTIVE SYSTEM, COMPARATIVE ANATOMY OF.

In past times reptiles have dominated the earth, swarming in the seas, along the shores, on the land, and in the air. They reached huge size, and many were herbivorous and preyed upon by others which, as they increased in size and power, must have been the principal active agency in the extermination of the fishes, amphibians, and great cuttlefishes, which previous to the Mesozoic age were the dominant animals of the earth. The alterations of physical conditions, which seem to have progressed steadily during the Mesozoic age, towards dryness and coolness in the atmosphere, as well as towards elevation and drainage of the land, and the gradual increase of density (salinity) in the sea, were probably unfavorable to the reptilian forms of that time, both directly and indirectly, by being likewise unfavorable to the creatures upon which they fed. On the other hand, the growing clarification of the atmosphere consequent upon the draining and elevation of the land and the spread of terrestrial vegetation, which subtracted its excess of carbonic-acid gas and contributed a larger amount of oxygen, stimulated the development of superior types which began in the Permian and slowly won their way in competition with the dinosaurian and other reptiles of their day until they finally overcame them in importance. Only the heavily armored turtles and crocodiles are able to survive freely in the water, land tortoises existing only by being very small, well protected, and secretive, and lizards only by having diminished to small size and acquired great agility. The only branch of the class that seems to be prosperous is that of the snakes, whose peculiar form, adaptive qualities, and excellent endowments for escape or defense enable them to fill a peculiar and little-contested place in the economy of the world.

Fossil Forms. The living reptiles are comparatively insignificant survivors of a mighty race whose first appearance antedates the Permian period, since remains of two widely dissimilar groups occur in Permian rocks in Europe, North America, and South Africa. First becoming abundant in the Triassic, the rise of reptiles is coincident with the decadence of the Stegocephalia, the great armored amphibians. In the Jurassic the development of reptiles attained its highest level; they dominated land, sea, and air in forms as grotesque as the mythical griffon, dragon, and sea serpent. It is noteworthy that the Mesozoic reptiles paralleled nearly all the adaptations which occurred ages later among the mammals. There were land reptiles of carnivorous habit,. like the cats and wolves, heavy, sluggish animals adapted to vegetable feeding, marine fishlike forms which strongly suggest the whales and porpoises, others which sat erect on the hind legs and tail, in some cases adapted to leaping like the kangaroo, and even "dragons of the air" with batlike wings. The supremacy of the reptiles extends into the Cretaceous with scarcely any diminution; in fact, it is here that several orders reach their culminating point; but towards the end of this period the dynasty of reptiles comes to an end, and at the dawn of the Eocene the mammals, which during the Mesozoic were extremely insignificant, become the reigning type.

Geographically the reptilian fauna of the Mesozoic period was almost cosmopolitan, although the contemporary faunas of widely separated regions sometimes show considerable dissimilarity. This variation may be due to different climatic conditions or to causes which prevent migration of animals. Regarding the general geological distribution of reptiles it may be stated that the Karoo formations (chiefly Lower Triassic) of South Africa have yielded the anomodont land reptiles in remarkable numbers and diversity of form, while the Middle Trias and the Jurassic of Europe are especially rich in marine forms. Above the Triassic no land reptiles are known for the Southern Hemisphere, the anomodonts having become extinct, but the northern continents, and especially North America, witnessed during the Jurassic and Cretaceous the development to gigantic size of ichthyosaurs, plesiosaurs, turtles, and especially dinosaurs. The pterodactyls attain huge proportions in the American Cretaceous, and here for the first time appear the great sea lizards or mosasaurs. It is certain that the true lizards, and probably snakes, existed in the Cretaceous, but as yet only a few doubtful remains have been discovered below the Eocene. None of the reptilian orders except those which exist at the present survived the Cretaceous, and the beginning of the Eocene witnessed a reptilian fauna essentially similar to that of to-day.

The origin of reptiles from stegocephalian Amphibia cannot be doubted; and as the earliest known reptile, palæohatteria, from the Lower Permian of Saxony, is already well differentiated from its stegocephalian contemporaries, it seems probable that reptiles existed as early as the Upper Carboniferous. Some of the Microsauria, a suborder of stegocephalians, are ranked by Gadow as reptiles. It is not improbable that the reptiles arose diphyletically, or in two parallel lines, from the Amphibia, and as far back as the Permian we find the widely divergent stems of the two great divisions of the order. Of late years the diphyletic character of the class has been noted by several writers, but it was not until 1902 that the two branches of reptilian descent were clearly differentiated by Osborn as subclasses, under the names Synapsida and Diapsida. These names refer to the condition of the temporal region of the skull—whether primitively a single temporal arch or separate upper and lower arches.

See special articles elsewhere in this work under the names of groups above mentioned, as DINOSAURIA; ICHTHYOSAURUS; THEROMORPHA; etc.

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REPTILE FUND. See Guelph Fund.

REPUB′LIC (Lat. *respublica, res publica,* commonwealth, from *res,* thing, affair + *publica,* public). A form of political organization in which the principal agents of government are chosen by qualified electors, to whom they are, in theory at least, responsible. Such electors may comprise the whole adult population of the state, or all qualified male citizens, or a small group of persons exercising a constitutional or hereditary power of election. The earlier republics were of the latter sort, ranging from the free but limited democracy of Athens to the narrow oligarchies which divided the sovereignty of Italy during the Middle Ages. The democratic movement of the last century has, in the freer political communities of the Western world, largely substituted a popular for an oligarchical electorate, thus giving to the world republics of the type of Switzerland, France, and the United States of America and creating a new but inaccurate definition of "republic" as synonymous with "popular government." See Democracy.

It is not to be denied that there may be a republic in reality which is not such in name, nor that a government which masquerades under republican forms may in fact be a thinly disguised monarchy or imperialism. In limiting the term "republic" to the form of government we must be understood as speaking of the form through which government is actually administered. A monarchy in which the crown has become merely the symbol of social distinction and no longer represents political authority may fairly be described as a republic in all but name; while a military autocracy, like that of the Cæsars, though veiling its assumption of arbitrary power under republican forms, is none the less a monarchy. That the English government is approximating to the former condition and that the military despotisms of Mexico and Central America are perilously near the latter cannot be denied, though it would be rash to say that in either case the conversion of the government from the one type to the other has yet become complete.

It is to the growing realization of this fact —that a republican form of government furnishes no guarantee against tyranny and that monarchy is not inconsistent with a high degree of political freedom—even more than to the conservative reaction of half a century ago, that we must attribute the change in the character and aims of the liberal movement of the last century. The widespread republican sentiment which in 1848 threatened the thrones of continental Europe has completely died out, and in its stead we find a growing sentiment for the liberalization of the monarchical institutions which survived that revolution. England has taken the place of the United States and Switzerland as the model of political reformers, and the aim is rather to transform existing institutions than to abolish them and substitute others of the republican type.

Attempts have been made, but without much success, to classify republics according to the extent to which popular power was diffused through the mass of the people. A more valid and useful distinction among governments of the republican type is found in the form in which the popular choice, whether wide or narrow, expresses itself, and this is determined not so much by political theory as by considerations of practical convenience. From this point of view republics fall into two classes, the pure and the representative. The former, illustrated in the local town government of New England, as well as in the Athenian democracy and the early Swiss republics, was strictly a government of the people by the people, all the citizens—a small and select class in Athens, the whole body of freemen in Appenzell and Schwyz—actually taking part in the administration of the state. This form of government is, from the nature of the case, limited to small and compact communities with simple and common interests, and does not lend itself to the solution of vast and complex problems of government. It is obviously unsuited to the great modern state with its large population, varied interests, and extensive dominion. For a republic of this type there is no alternative but the adoption of the representative form of government.

Democratic government everywhere, but especially in its republican form, calls for character as well as a highly developed political instinct in the mass of the people constituting the state; and when these conditions exist we may reasonably believe that, in a world which has come to cherish industrial rather than militant ideals, the popular republic may have a stability, a good order, and a capacity for progress which no other form of government has yet displayed. See Cabinet; Constitution; Constitution of the United States; Democracy; Government, and the authorities there referred to.

REPUBLICAN METHODIST CHURCH. See Methodism; O'Kelly, James.

REPUB′LICAN PARTY. In the history of American politics the term Republican has been applied to political organizations representing the most diverse principles. During the years 1791–92, under the leadership of Jefferson, the opponents of centralization in the national government were molded into an effective political party, which assumed the official name Democratic-Republican, though its members generally called themselves Republicans. Later this organization became known as the Democratic party (q.v.). During the years 1825–29 the followers of Clay and of Adams were known as National Republicans. (See Whig Party.) In ordinary usage, however, the term Republican is applied to the powerful party which was organized in 1854–56 and elected Lincoln in 1860.

The present Republican party took its rise from one overpowering impulse—opposition to the extension of slavery. Northern Whigs acceded with great repugnance to the new Fugitive Slave Law of 1850 (see Compromise of 1850), and its enforcement became daily more odious. When the Kansas-Nebraska Bill (q.v.) became a law the revolt was instantaneous. On the very morning after the passing of this bill, May 27, 1854, a gathering of some 30 Congressmen discussed the necessity of organizing a new party, and it was agreed that Republican would be its appropriate name. Previously, on Feb. 28, 1854, a mass meeting of Whigs, Democrats, and Free-Soilers, in Ripon, Wis., had resolved that if the Kansas-Nebraska Bill should pass they would "throw old party organizations to the winds and organize a new party on the sole issue of the nonextension of slavery." Three weeks later local organization was effected, and the name Republican was suggested as the one which the party should and probably would adopt. It was in Michigan, however, that the fusion of the opponents of the extension of slavery first completed a State organization and formally adopted the name (July 6, 1854).

The new party was formed not so much by a coalition as by a fusion of diverse elements. There were: (*a*) a large proportion of the antislavery Whigs, like Seward, Greeley, and Lincoln; (*b*) the Free-Soilers (see FREE-SOIL PARTY), like Hale, Julian, and Sumner; (*c*) a great body of Know-Nothings, like Wilson, Banks, and Colfax; (*d*) some Abolitionists, who, though impatient with the Republicans' repeated assertion that they did not purpose to interfere with slavery where it actually existed, nevertheless found in the new party the best promise of effective opposition to slavery; and finally (*e*) antislavery Democrats, such as Hamlin, Cameron, and Bryant, who brought with them a strong popularizing influence. Later the war crisis led other Democrats into the Republican ranks, though in some instances, as in the cases of Butler and Johnson, their allegiance was but temporary.

Before the new party had been in existence a year it had secured a popular majority for the opponents of slavery in 15 of the 31 States and had elected 11 United States Senators and a plurality in the House of Representatives. The first Republican National Convention met at Philadelphia on June 17, 1856, and was attended by delegates from all the Northern States, from the Territories of Minnesota, Nebraska, and Kansas, from the District of Columbia, from Virginia, and from the border States of Delaware, Maryland, and Kentucky. The nomination for the presidency was given to John C. Frémont, whose career as an explorer and pioneer made him a magnetic leader. The platform declared it to be "both the right and the duty of Congress to prohibit in the Territories those twin relics of barbarism, polygamy and slavery"; it demanded the immediate admission of Kansas as a free State and denounced the Ostend Manifesto (q.v.), "with its highwayman's plea that might makes right." Whig influence was apparent in its strong declaration in favor of internal improvements at national expense, including the construction of a railway to the Pacific. Frémont obtained 114 electoral votes (Buchanan, the Democratic candidate, receiving 174) and polled a popular vote of 1,341,264, carrying all the free States with the exception of New Jersey, California, Pennsylvania, Indiana, and Illinois. (See ELECTORAL VOTES; UNITED STATES, *History*, for details on presidential elections.) A slight falling off in Republican strength in Congress reflected the waning of the first enthusiasm and the defection of some of the least disinterested members, but their places were soon more than filled by new adherents from the shattered American party and from Whigs and Democrats, to whom the Dred Scott decision and the Lecompton Bill were intolerable. During Buchanan's administration the Republicans devoted their efforts to protesting against the extension of slavery and to unsuccessful attempts to secure the passage of a homestead bill and the appropriation of public lands for educational purposes. In 1860 the Republican National Convention was held in Chicago. The platform denounced Democratic threats of disunion; insisted that the rights of the State should be maintained inviolate, especially the right of each State to order and control its own domestic institutions according to its own judgment exclusively; declared that "the normal condition of all the territory of the United States is that of freedom, which Congress is bound to preserve and defend"; demanded the prompt admission of Kansas as a free State and the passage of a homestead bill; favored a protective tariff and river and harbor improvements; and advocated a Pacific railway, to be aided by national grants. On the third ballot the nomination fell to Lincoln, largely from considerations of availability, for as yet the full measure of his strength had by no means been revealed. Governor Hamlin, of Maine, a former Democrat, was given the second place on the ticket. Out of the 303 electoral votes Lincoln received 180 and his plurality was nearly 500,000; but his strength was exclusively in the North, and his vote fell far short of a majority.

Republican rule began even before Lincoln's inauguration, for in the closing months of the Thirtieth Congress the withdrawal of Southern members gave the Republicans a majority in both Houses, a fact promptly signalized by the admission of Kansas and by the passage of a protective tariff act. The conduct of the war against the Confederate States was thrown into the hands of the loose-constructionist Republican party; yet the opposition, especially in the later years of the conflict, was vigorous. The chief war measures were enacted by Republican votes, and favorite Republican policies were also brought to realization in the Homestead Bill of 1862 and the grants in aid of railways and of education. Really pivotal, however, was the party's policy towards slavery. Here Lincoln himself took the lead. The preliminary Proclamation of Emancipation (q.v.), issued upon his own responsibility, served to "unite the South and divide the North." Formidable reaction followed, and in the autumn elections of 1862 the very existence of the Union was at stake. No one could doubt that the loss of Republican ascendancy would result in the ending of the war by some compromise which would involve the dissolution of the Union, yet the great States New York, Pennsylvania, Ohio, Indiana, and Illinois all showed Democratic majorities; but the New England States, Kansas and Minnesota, California and Oregon followed the President's leading, and the border States, too, came to the support of his policy. In the resulting Congress the Republicans found themselves in control by a majority of about 20 votes. Lincoln's policy had been vindicated: he had been clear-sighted enough to recognize that the moment had come to commit the party to an aggressive policy, and on a question of right and wrong he had been willing to trust the people. But nothing less than an amendment to the Constitution could be relied upon actually to abolish slavery forever. Such an amendment was proposed in December, 1863, but went over to the next session, and therefore became one of the vital issues of the campaign of 1864. Lincoln insisted that the advocacy of such an amendment should be made the "keystone" of the platform. The Republican Convention now declared that slavery was the cause and the strength of the rebellion; that the Constitution should be so amended as to "terminate and forever prohibit the existence of slavery within the limits or the jurisdiction of the United States"; and that no terms but unconditional surrender should be granted to the rebellious States. Lincoln was renominated by acclamation, and, as a mark of recognition of the patriotism of the loyal men of the border States, the nomination for the vice presidency was given to Andrew Johnson, of Tennessee. Lincoln's vote in the electoral college exceeded that of his Democratic opponent, McClellan, 10 to 1, yet it is significant that his popular majority was less than 500,000. Jan. 28, 1865, with the aid of 11 Democratic votes, the joint resolution (vide Thirteenth Amendment to the United States Constitution) was passed by the House.

The end of the war found the Republican party strong and united. But a severer test awaited it in the problem of reconstruction (q.v.), and but few weeks were needed to show how irreparable a loss the party had sustained in the death of Lincoln. During Johnson's administration the Republican majority in both Houses of Congress was overwhelming. Between the President and Congress there speedily arose over the policy to be pursued in reconstructing the South a controversy which culminated in the unsuccessful impeachment. The party in its platform of 1868 sanctioned the reconstruction policy of Congress and insisted upon "equal suffrage to all loyal men in the South." General Grant received the unanimous nomination for the presidency. His election was made a certainty by the fact that in the South negro suffrage was protected by Federal arms, while many of the whites were still disfranchised. Consequently only four of the Southern States, Delaware, Maryland, Kentucky, and Louisiana, chose Democratic electors. Republican majorities were maintained in both branches throughout Grant's first administration, although the opposition was gradually gaining strength. As a party measure the ratification of the Fourteenth and Fifteenth amendments was exacted from Mississippi, Texas, and Virginia as a condition precedent to readmission, and the appointment of Federal supervisors of elections was authorized. Stimulated by protests against the manipulation of office for private or party purposes, the Republicans passed the first law for the reform of the civil service. The growing sentiment in favor of universal amnesty, universal enfranchisement, civil-service reform, and the limiting of the power of the Federal government over the local affairs of the States led to the breaking away of the Liberal Republicans (q.v.), who in 1872 made these the chief planks in their platform. Their avowed failure to come to any agreement as to the tariff, and their ill-advised nomination of Greeley, made the movement but a slight menace to the reëlection of Grant, whom the Republicans had unanimously renominated upon a platform consisting chiefly of a glorification of the party's past achievements and strongly advocating a protective tariff. As a result of the Crédit Mobilier (q.v.) and other scandals the feeling became widespread that the Republican party's long tenure of office had lowered the ethical tone of the party and had given it into the hands of self-seeking and overbearing leaders. Moreover, the Republicans, as the party in power, were held responsible for the panic of 1873. Hence defection grew to such an extent that many of the Northern States were carried by the Democrats, who in 1875 secured a majority of 182 to 110 in the House. The Republican National Convention in 1876 indorsed civil-service reform and commended the provision already made for the resumption of specie payments. The nomination for the presidency was given to Governor Hayes, of Ohio, and in the ensuing campaign many of the Liberal Republican bolters returned to their former allegiance. The result of the election was long in doubt, but by the Electoral Commission (q.v.) all the questions at issue were decided in favor of Hayes, who was declared to have received 185 votes to 184 for Tilden, his Democratic opponent.

With the administration of Hayes a new period in the history of the Republican party began. The task which faced it was new, for economic problems upon which neither party had developed well-united views had become dominant; the currency, the tariff, and commercial relations were to be adjusted to the new and rapidly expanding industrial life of the people. In the first two years of Hayes's administration the Democrats were in control of the House and in the last two years of both branches of Congress, while from the members of his own party the President received but half-hearted support, for it was by the aid of Republican votes that the Bland Silver Purchase Bill was passed over his veto and that the further retirement of United States notes was forbidden. The Republican Convention of 1880 favored a protective tariff, Federal aid to popular education, "the protection of the honest voter at the South," and thorough civil-service reform. Grant was for a time the leading candidate, but after a long contest the convention was stampeded for Garfield, who was nominated on the thirty-sixth ballot. In order to conciliate the supporters of Grant, the second place on the ticket was given to Chester A. Arthur. During the administrations of Garfield and Arthur party lines were greatly blurred. The Tariff Act of 1883 and also the Pendleton Civil Service Bill received support from both sides of the chambers, yet they were in the main regarded as Republican measures. In 1884 the Republican platform was unusually pronounced in its advocacy of a protective tariff and urged international bimetallism, the regulation of interstate commerce, and the restoration of the navy to its old-time strength and efficiency. The nomination of Blaine proved in many respects to be ill-advised. A large section of the party (see MUGWUMP) refused to support him, and gave their votes mainly for Cleveland, who was elected, carrying not only the solid South, but also New York, Connecticut, New Jersey, and Indiana. During his administration Democrats were in the majority in the House. Substantial gains were made in the reform of the civil service and in the regulation of interstate commerce (Act of 1887), both of which the Republican platform had urged. A protectionist faction in the Democratic party aided the Republicans in preventing a reduction of import duties. Cleveland's message of December, 1887, made the tariff the dominant issue of the campaign of the following year. The Republican platform declared the party to be "uncompromisingly in favor of the American system of protection"; asserted its opposition to combinations organized "to control arbitrarily the conditions of trade among citizens"; favored the "use of both silver and gold as money" and the building up of a strong navy. The nomination of Harrison, of Indiana, and Morton, of New York, helped the party to regain those States and win the election. A scanty majority was secured in both branches of Congress. The Omnibus Bill for the admission of the Dakotas, Montana, and Washington brought the Republicans some votes, and Speaker Reed's rules put the House under the firm control of the majority, although they aroused not a little opposition. The protectionist McKinley Tariff

Bill was passed, with the addition of a reciprocity clause. But in the congressional elections of 1890 the Republicans were overwhelmingly defeated, and the Democrats carried the presidential election of 1892 by a large electoral majority. The Republican platform had been very similar to that of 1888, and the nominations had aroused little enthusiasm; a rise in retail prices had followed the going into effect of the McKinley tariff and had made it unpopular. During the first half of Cleveland's second administration the Republicans were in a decided minority in both Houses. But the reaction due to the disastrous panic of 1893 and dissatisfaction with the long-deferred and inconsistent Wilson-Gorman Tariff Bill presently reversed the situation in Congress, again bringing the Republicans into control. In the campaign of 1896 the currency issue was the all-important one. Twenty-two Republican State conventions pronounced against the free coinage of silver, and the platform of the national convention asserted the party's opposition to free coinage except by international agreement. Upon the adoption of this resolution 34 free-silver delegates withdrew from the convention. The platform further "renewed and emphasized the party's allegiance to the policy of protection" and promised "to all of our products" "the most ample protection"; it favored a protectorate over Hawaii and insisted that the United States "should actively use its influence and good offices to restore peace and give independence to Cuba." In this campaign the Republicans received aid from the Gold Democrats; even the solid South was broken. McKinley received a majority over all other candidates of 286,257. The appeal which the Democrats had made to class animosity had reacted in favor of the Republicans as the party of conservatism. In the following year the Republicans found themselves in control of both branches of Congress, though their majority in the Senate was but narrow. The Dingley Bill was promptly passed, restoring the strongly protective character to the tariff. The war with Spain in 1898 forced to the front questions of policy which had been quite unforeseen and on which clean-cut party lines could not be drawn. The annexation of Hawaii had long been a favorite measure with some Republicans and was effected by Republican votes. In 1899 the Republicans secured a strong majority in the Senate, and forthwith enacted a law making the gold dollar unequivocally the unit of value. Upon questions relating to the government of dependencies, however, there was some crossing of party lines, a few leading Republicans with most of the Democrats taking the ground that the United States could not govern alien peoples without the consent of the governed. In the campaign of 1900 the great issue was that of imperialistic expansion. The Republican platform renewed the pledge of independence to Cuba and declared it to be "the high duty of the government" "to put down armed insurrection and to confer the blessings of liberty and civilization upon all rescued peoples," promising them the largest measure of self-government consistent with their welfare and American duties. Again McKinley was the Republican nominee against Bryan, and he increased his vote over that of 1896. Outside of the Southern States the Democrats secured only 13 electoral votes, all from States dominated by the silver interest. In the first Congress of the new century the Republicans increased their strength in both Houses. The pledge of Cuban independence was redeemed, but within the party there arose serious differences as to the policy to be pursued towards the Philippines and also over reciprocity, which had been strongly indorsed in Republican platforms, but to which large financial interests, of great weight in Republican councils, stood inflexibly opposed.

After the assassination of McKinley in 1901 a tendency towards a fission in the party became manifest, although Roosevelt attempted as nearly as possible to carry out McKinley's policies. With the election of Roosevelt to the presidency in 1904 the split in party policy became more marked. A vigorous contest was carried on between the conservative and progressive wings, with the favor of the administration thrown largely to the latter. The contest centred in the struggle for a reform of the rules of legislative procedure in Congress, in the question of regulation of railways and trusts, the conservation of natural resources, and in the question of efficiency of administration. In the West a movement had gained great headway within the party for so-called direct government (initiative, referendum, and recall, qq.v.); moreover, the Middle West manifested a tendency towards more moderate customs duties. The election of Taft in 1908, although expected to continue the policies of Roosevelt, proved in fact a triumph for the conservative wing. The revision of the tariff in 1909, instead of moderating the rigors of the old law, actually increased them in many respects. The appointment of Ballinger as Secretary of the Interior was a practical defeat for the conservationists. In the contest over Canadian reciprocity (see RECIPROCITY) the administration threw its influence to the progressives. Otherwise the Taft administration was regarded as reactionary; hence the unsuccessful attempt of the progressive wing to defeat the renomination of Taft in the elections of 1912. As a consequence of the secession of the Progressive party (q.v.) the Republicans were overwhelmingly beaten, receiving only eight electoral votes and losing both Houses of Congress. In 1914 the Republican vote increased to a marked degree in almost every State. The effect was shown particularly in the House where a large Democratic majority was considerably reduced.

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John Hay, *Fifty Years of the Republican Party* (ib., 1907); J. S. P. Kleeberg, *Formation of the Republican Party as a National Political Organization* (ib., 1912); Theodore Roosevelt, *An Autobiography* (ib., 1913); McLaughlin and Hart (eds.), *Cyclopedia of American Government*, vol. iii (ib., 1914).

REPUBLICAN RIVER. One of the head streams of the Kansas River (Map: Kansas, D & E 3). It is formed by two forks in east-central Colorado, and flows northeast into Nebraska, then east, and finally southeast into Kansas, where it joins the Smoky Hill River at Junction City to form the Kansas River. It is about 500 miles long.

REPU'DIA'TION (Lat. *repudiatio*, from *repudiare*, to repudiate, from *repudium*, repudiation, rejection of what one is ashamed of, from *re-*, back again, anew + *pudere*, to be ashamed). The refusal of a state or government to pay its debt. It grows out of the practical bankruptcy of the state, though it often seeks justification in the plea that the obligations previously admitted were illegal and therefore invalid. Debt scaling by refunding operations frequently approaches repudiation in its practical effects, though it generally escapes the reproach of the name unless there are obligations or classes of obligations which are wholly ignored in the process. Among nations and states of weak public credit the practices mentioned are only too familiar, but the odium of the name attaches particularly to the history of the financiering of the American commonwealths. In 1790 all existing State debts had been assumed by the general government, partly on the ground of justice, because they had been contracted in the prosecution of the Revolutionary War, partly on that of expediency, as a means of strengthening the position of the central government. For a period of 40 years thereafter the State governments remained almost free from liabilities, notwithstanding the fact that the War of 1812 had called for extraordinary expenditures, and in 1830 the aggregate debt of all the States was only $13,000,000. Then began an era of extravagant speculation and reckless enterprise. Population was increasing and production was increasing even faster than population. The resources of the soil were more than equal to any demands that could be made upon them. But as yet no adequate means of communication between producer and consumer had been established, and a universal need was felt for such facilities of transportation as would insure quick delivery at moderate rates. To the sanguine colonist it seemed that the construction of railroads and canals was a work of public importance which would justify almost any financial assistance on the part of the State and would return the investment a hundredfold.

States issued bonds in aid of the construction of railroads and canals, and in the South especially subscribed to bank stock, for the purchase of which they issued bonds. In other cases they simply indorsed the bonds of railroads and banks. Nor was it difficult for the States to secure loans. The United States national credit stood high abroad. Not only had the interest been promptly paid upon the national debt, but the United States offered the extraordinary spectacle of a nation which had actually paid the principal. European money lenders, who had not yet learned to discriminate between national and State securities, felt confidence both in the honor and in the resources of the country. The bonds of the several States were therefore easily disposed of in foreign markets, until in 1842 their aggregate debt had swollen to the enormous total of $213,000,000, an increase of more than 1500 per cent since 1830. The panic of 1837 and the subsequent tightening of the money market precipitated the inevitable crash. First Indiana found it impossible to meet the interest of her debts in 1840; Ohio was saved from following her example only by extraordinary efforts. Two years later the Bank of Pennsylvania failed and every bank south of Philadelphia suspended payment. In the panic that ensued Pennsylvania, Maryland, Mississippi, Michigan, Florida, Indiana, and Illinois found themselves in a condition approaching bankruptcy. But though all these States suspended payment of accruing interest, all of them except Mississippi, Michigan, and Florida finally weathered the storm without resorting to the repudiation of any part of the capital debt.

It was in Mississippi that the word "repudiation" came into use in a message by Governor McNutt of that State suggesting the plan of "repudiating the sale of certain of the State bonds on account of fraud and illegality." The bonds, to the amount of $5,000,000, had been issued in 1838 as a subscription to stock of the Union Bank of Mississippi. As the bank succumbed early to reckless management and the security of the State became worthless, the State found itself saddled with a debt from whose expenditure it had had no benefit. It is not surprising that certain apparent irregularities in the issue of the bonds should be seized upon as a pretext for denying the debt, though the courts of the State later decided that these irregularities were not so material as to invalidate the bonds. The Legislature of Mississippi promptly branded this suggestion of repudiation as "a calumny upon the justice, honor, and dignity of the State." But though for the time being the bonds were thus saved from being formally repudiated, they fell into default. Successive governors, indeed, urged their payment, but no provision was made for the purpose until 1852, when a proposition to levy a tax to pay the bonds and interest was submitted to the people and defeated at the polls by an overwhelming majority. Florida, which in the thirties had borrowed about $3,900,000 for the support of banks, was caught in the bank failures and refused to pay her debts. In the meanwhile Michigan had repudiated a portion of its liabilities under the following circumstances: certain bonds had been disposed of to the Morris Canal and Banking Company, to be paid for in installments. The Bank of Pennsylvania had become surety for the payment of these installments as they fell due. But canal company and bank both failed. It was ascertained that a large amount of the bonds, for which only partial payment had been made, had been transferred from the canal company to the bank, the latter having full knowledge, of course, of all the facts. It is true that the bonds had been hypothecated in foreign markets and were now in the possession of innocent holders. Nevertheless the State claimed that it was bound to repay only the money it had actually received, called for the surrender of the part-paid bonds, and issued new certificates for the amount it had actually received, with interest thereon.

The course pursued by Louisiana was equally open to criticism. The state had raised capital for internal improvements by loaning her credit to banks whose stock was secured by mortgages on real estate. During the era of prosperity these banks discounted a great deal of business paper which turned out to be bad when the day of trial came. In 1843 the Legislature enacted that all debts due to the bank should be payable in the depreciated State bonds issued by the banks at their par value. In ante-bellum times, however, repudiation was in its infancy. After the war it sprang to great proportions, as the Southern States generally repudiated their debts. The burden of debts had greatly increased from 1860 to 1870, while the resources of the country had been wasted by the war. Practically no interest had been paid upon the debt contracted before the war. The so-called period of reconstruction was, moreover, riotous in its expenditure of public moneys and brought about a large increase of the debt. With the revival of old conditions and the return to power of the classes which nominally ruled the States, the inability to pay resulting from the impoverished condition of the country was combined with a reluctance to pay debts which in their opinion had been forced upon the States by outsiders. In this category they placed the accrued interest upon ante-bellum debts as well as much of the debt which had its birth in the so-called reconstruction era. It is impossible to follow the history in all its details. With pretexts of fraud, jobbing, and corruption in the issue of bonds, or on the simple plea of poverty, one Southern State after another annulled its obligations outright or so scaled them in refunding operations as to destroy a large part of their face value. The aggregate debts of the States along the coast from Virginia to Louisiana, with Arkansas and Tennessee, are computed to have reached, each State taken at its highest point, $236,000,000, while in 1880, after the policy of repudiation had been adopted, they amounted to $108,000,000. The Southern States were joined by one Northern State, Minnesota, which in 1880, after 22 years of agitation, denunciation, and negotiation, finally agreed to compromise the payment of certain railroad bonds (guaranteed by her as far back as 1858) at 50 cents on the dollar and accrued interest, the plea being that the railroads had failed to comply with the conditions of the issue. The inevitable result of repudiation has been that foreign capitalists have learned to discriminate between the values of different State securities; and while the bonds of the nonrepudiating States, including those Southern States which have not followed the example of their neighbors, command a premium, the bonds of the various repudiating States fluctuate at from 10 to 50 per cent of their face value.

Repudiation has not been confined to States. During the five years immediately following the panic of 1873, numerous cities, towns, and counties, even within those States whose corporate credit remained unimpaired, finding it impossible to meet their obligations, sought to evade them by repudiation. By appeal to the United States courts, however, their creditors could command an impartial judicial determination of the question. This is impossible in the case of States, as the Eleventh Amendment of the Constitution, adopted in 1794, expressly provides that though individuals may be sued by States, States cannot be sued by individuals. Under this amendment and the decisions which have grown out of it no power can legally coerce a State to keep its pledges. There is therefore no power in the United States government to prevent a recurrence of the humiliating spectacle of repudiation. The States only can provide remedies for it. The substantial increase of wealth in all sections of the country affords a guarantee for the future. Another and perhaps more efficient safeguard against its recurrence is to be found in the innumerable restrictions upon the debt-making power of the States which have found their way into recent State constitutions.

Consult: Isaac Butts, *Brief Reasons for Repudiation, Applicable to the War Debts of All Nations* (New York, 1869); G. W. Green, *Repudiation* (ib., 1883); W. A. Scott, *The Repudiation of State Debts* (ib., 1893); D. R. Dewey, *Financial History of the United States* (3d ed., ib., 1907).

REQUEST, Letter of. See Letter.

REQUIEM, rē′kwĭ-ĕm (Lat., rest). In the Roman Catholic church, the mass for the dead; so called from the first word of the introit. Requiem masses were composed by many of the older masters, such as Palestrina, Vittoria, Anerio, Colonna. The most famous works of this kind in modern times are those of Mozart (1791); two of Cherubini, C minor (1793), D minor (1836); Berlioz (1837); Verdi (1873). One of the greatest choral works ever written bears also the title "requiem," although it is written to German words selected from the Bible. This is the great *Ein deutsches Requiem* by Brahms, written on the death of his mother (1868).

REQUISITIONS, rĕk′wĭ-zĭsh′ŭnz (Lat. *requisitio*, from *requirere*, to search for, require, from *re-*, back again, anew + *quærere*, to seek). Articles of daily consumption and use levied by an invading army from the inhabitants of occupied territory. They must be distinguished from contributions, with which the term is often confused, the latter being properly confined to money impositions above the ordinary revenues, which legitimately belong to the invader; and from fines, which are payment exacted from a district by way of punishment for some offense committed against the occupying enemy outside the regular military operations.

The adoption by civilized nations of modern rules of warfare prohibiting pillage does not guarantee security of property to an invaded district. The experiences of the past century have authorized three methods of obtaining support for an invading army from an occupied district. (1) It may purchase provisions and like articles required for consumption; (2) it may levy them at prices fixed by the commander; (3) it may force the inhabitants to furnish them without payment and on refusal send out detachments to collect them. Thus, the produce of the farmer, the goods of the merchant, and the stock of the trader may be confiscated. By the Brussels Military Code (1874), Articles 40, 42, rules are laid down governing the making of requisitions. It is customary for the modern army to have a vast commissary train, and requisitions are relied upon only to supplement this supply. The commander of the army may levy such articles as clothing and boots, to prepare which time is required, while corps commanders may requisition food and fodder for immediate use. The collections should be made through the local authorities, if these continue, by demand in writing, and receipt should be given as evidence of the compliance and as a voucher in case the government should subsequently recoup the inhabitants. The discretion of the invader must be employed to apportion these demands to the resources of the district. The Hague conferences of 1898 and 1907 attempted to regulate and limit the military practice of making requisitions on the inhabitants of conquered territory by providing that requisitions either in kind or services cannot be demanded from communities or individuals except for the needs of the army of occupation and only in proportion to the resources of the country, and that payment should, whenever possible, be made in cash or as soon as possible (Hague Regulations, 52), but during the European War which broke out in 1914 these provisions were liberally construed by the invading forces, especially in the case of the German occupation of Belgium. Contributions, on the other hand, should be imposed only "on the order and responsibility of the general in chief, or of the supreme civil authority, established by the enemy in the occupied territory" (Brussels Code, § 41). In levying contributions assessment should be made on the lines of civil taxation. Fines may be levied by the invading commander to secure the safety of his communications and his troops. Consult: "Instructions for the Government of the Armies of the United States in the Field," *General Order No. 100, Adjutant General's Office* (Washington, 1863); "Brussels Military Code," in *Proceedings of Brussels Conference* (Brussels, 1874); "Hague Military Code," in *Proceedings of The Hague Conference* (The Hague, 1898).

REREDOS, rēr′dŏs (OF., behind the back). The wall, curtain, or screen at the back of an altar, usually in the form of a screen detached from the choir. It is of two forms, a slight movable screen and a permanent heavier structure. Its use was not common until in the late eleventh century the change of orientation (q.v.) in the Western churches placed the priest between the altar and the congregation. Early examples were often merely tapestries hung on rods; some were screens of gold and silver reliefs rising at the back of the altar, like the Pala d'Oro at San Marco, Venice, and that at San Jacopo, Pistoia, while others were of carved ivory, like one in the Cluny Museum (Paris). The architectural screens, with niches, statues, marble reliefs, and paintings, are especially fine in English (late Gothic) and Spanish (early Renaissance) churches. The reredos and the altarpiece (see ALTAR) are often one and the same; in other cases the reredos is a permanently fixed construction, often in England dividing the choir from the retrochoir.

RESACA DE LA PALMA, rå-sä′kȧ då lȧ päl′ṃȧ, BATTLE OF. A short but hotly contested engagement, fought on May 9, 1846, during the Mexican War, between about 5000 Mexicans under General Arista and about 2300 Americans under General Taylor, which ended in the defeat of the Mexicans. The ravine in which it occurred, covered by a thick growth of palm trees, is in Cameron Co., Tex., 4 miles north of Brownsville, on the Point Isabel road. The Americans lost 39 killed and 83 wounded, the Mexicans about 160 killed, 228 wounded, and 100 missing. Consult: H. O. Ladd, *The War with Mexico* (New York, 1883); H. H. Bancroft, *History of Mexico*, vol. v (San Francisco; 1885); O. O. Howard, *Life of General Taylor* (New York, 1892). See MEXICAN WAR.

RÉSAL, rå′zäl′, HENRY AMÉ (1828–96). A French mathematician and engineer, born in Plombières (Vosges) and educated at the Ecole Polytechnique and at the School of Mines. He served for 15 years as departmental engineer of Doubs, gaining some repute there for his work on the mathematics of geology. Transferred to Paris in 1870, he became professor of mechanics in the Polytechnique in 1872, was elected to the Academy of Sciences in 1873, and in 1888 was appointed inspector general of mines. Résal wrote many valuable memoirs on mechanics and physics. His published works include: *Traité de cinématique pure* (1862); *Traité de mécanique céleste* (1865; 2d ed., 1884); *Traité de mécanique générale* (1873–89); *Traité des surfaces* (1891); and a French version of Salmon's *Analytical Geometry* (1870).

RESCISSION, rė-sĭzh′ŭn (Lat. *rescissio*, a cutting off, retrenchment, from *rescindere*, to cut off, from *re-*, back again, anew + *scindere*, to cut). In law, the rescinding or setting aside of a contract, either by mutual agreement of the parties or by decree of a court of equity because of some legal defect in the contract. See CONTRACT.

In the case of rescission not depending on mutual agreement the right to rescind may be based either upon fraud or mistake in the inception of the contract. The right of rescission on the ground of fraud arises as soon as the party who is entitled to rescind has notice of the fraud. If with full knowledge of the fraud he continues to act under the contract or pursuant to its terms, he will be deemed to have approved the contract and to have waived his right to rescind. Upon rescission of the contract he is entitled to compel a restoration of property which he has given in performance of the contract on his part or to recover its money value in a quasi-contract action. He cannot, however, recover the property so given from third parties who are purchasers for value without notice. See EQUITY; FRAUD.

A court of equity will disregard the parol-evidence rule as to written contracts if it finds that there was actually no agreement or meeting of the minds of the parties as to the terms of the contract, and it will compel a surrender and cancellation of the written contract and a restoration of the parties to their original positions. In case of all verbal contracts one entitled to rescind may do so without the aid of a legal proceeding by merely giving notice. This right, although equitable in character, is recognized and enforced at law. Upon giving such notice to the other party to the contract it is thereupon deemed to be at an end; and the party rescinding the contract is entitled to receive back the money or property which he has given under the contract, the title to the property being revested in him by operation of law as consequence of the rescission. He may not lawfully take the property forcibly, however, but may at his election bring an action in quasi contract for the value of his performance under the contract, or trover for damages for refusal to return property, or replevin or ejectment to recover the property itself. As a condition precedent to the exercise of the right of rescission he should also return any money or property which he has received under the contract.

In case of all contracts, whether written or verbal, if one entitled to rescind the contract on the ground of fraud is sued upon it, he may set up the fraud as a defense. Fraud is strictly an equitable defense, but it has been completely adopted by the law. It does not conflict with the parol-evidence rule, as the effect of proof of fraud is not to vary the terms of the contract, but to show that on equitable grounds the contract actually entered into should not be permitted to remain operative. If, however, one who has entered into a written contract wishes to be released from its obligations at any time on the ground of mistake, or if he wishes to be released from the contract at any time before he is actually sued upon it on the ground that the contract was induced by fraud, his only relief is in equity, since the primary relief which he seeks is the cancellation and surrender of the contract. See CHANCERY; EQUITY. See also REFORMATION.

RE′SCRIPTS (Lat. *rescriptum*, answer, from *rescribere*, to write back, from *re-*, back again, anew + *scribere*, to write). Answers of the emperors and popes to questions in jurisprudence officially propounded to them. In the Roman Empire the *rescripta principis* were one of the authoritative sources of the civil law. After the third century they increased in number rapidly and superseded the responses of the jurists as one of the most important sources of Roman law, the privilege of giving responses no longer being conferred upon the jurists. The rescripts directed to corporate and municipal bodies were known as *pragmaticæ sanctiones*, a name which has found its way into the public law of Europe. See PRAGMATIC SANCTION.

RES′CUE. In criminal law, the criminal offense of procuring or aiding in the forcible deliverance of a prisoner from lawful imprisonment by a third person. By the common law a rescuer was held guilty of the same degree of crime as the prisoner, if he knew when he rescued him that the latter was lawfully detained. This knowledge was presumed if the culprit was in prison or in the custody of an officer of the law at the time. To-day the offense is punishable in most jurisdictions by imprisonment, but not with the same severity as at common law. See PRISON BREACH.

In maritime law a rescue is the retaking of a captured prize from the enemy by prisoners of war. The latter do not acquire any rights in the recaptured property, but must return it to the lawful owners.

RESCUE GRASS, SCHRADER'S BROME GRASS, AUSTRALIAN OAT (*Bromus unioloides*). A strong-growing South American grass introduced into many parts of the world. Its leaves are flat, linear, slightly roughened, its panicles spreading with numerous rather large flattened spikelets resembling the well-known chess or cheat, to which it is closely related. It grows rapidly 1 to 3 feet high, seeds freely, and dies after seeding. In the southern United States it is regarded as one of the best winter grasses, as it makes its principal growth during cool weather. It is usually cut several times during the season, and if prevented from seeding continues for two or three years. If properly treated it is a valuable brome grass (q.v.), excelling rye or oats as a winter grass and in the large amount of nutritious hay it yields. It withstands drought well and will grow on almost any soil; its best growth, however, is on rich moist soil.

RESEC′TION (Lat. *resectio*, from *resecare*, to cut off, from *re-*, back again, anew + *secare*, to cut; connected with OHG. *sega*, Ger. *Säge*, AS. *sage*, *sayu*, Eng. *saw*), or EXCISION OF JOINTS. An operation in which the diseased bone of a joint is cut out in place of cutting off the entire limb.

RES′ERVA′TION (ML. *reservatio*, from Lat. *reservare*, to keep back, from *re-*, back again, anew + *servare*, to keep). In English law a term applied to a clause in a deed, lease, or grant of land, which reserves out of the estate conveyed a right or interest in a portion of it. An estate in a stranger, or person not a party to the conveyance, cannot be created by reservation, which can only operate in favor of the grantor himself. In the United States the word is frequently used as synonymous with "exception," which denotes, not a reserved right in land conveyed, but the exception from the conveyance of part or parcel of the land included in it. See CONVEYANCE; DEED; LEASE; MORTGAGE.

The term is also employed to describe a method of obtaining the opinion of a full bench of a court or an appellate tribunal upon a point of law as to which the trial judge is doubtful. This often saves the necessity of making a ruling compelling the parties to appeal afterward. The jury is usually allowed to find the facts, and the verdict or judgment is not entered until the reserved point is decided. In many of the American States this is accomplished by taking a verdict of the jury subject to the opinion of the court as to the legal effect of the facts found by such verdict.

RESERVATIONS, INDIAN. See INDIAN AFFAIRS; TREATIES, INDIAN.

RESERVE′ (OF. *reserve*, Fr. *réserve*, from OF. *reserver*, Fr. *réserver*, to reserve, from Lat. *reservare*, to keep back). In a military sense the word is used to designate the material and personnel retained for future use. For example, in the army organization of the United States, in material there is for each division an ammunition reserve of 120 cartridges per rifle, 10,000 for each machine gun, and 100 rounds for each field gun, necessitating approximately eight ammunition wagons for each regiment of infantry or cavalry and one wagon or caisson for each gun. These vehicles are organized into wagon companies or ammunition batteries and constitute the ammunition train of the division. Supply trains, normally one for each division, carry the reserve subsistence and grain (generally three days) for the division. These trains constitute the rolling reserve following the combatant troops at such a distance as to be readily accessible when needed. In addition to the subsistence mentioned each soldier carries on his person a two days' reserve ration which is to be used only in case of extreme necessity. Reserve explosives and other material for military demolition are held at the engineer park. Wagons carrying reserve sanitary stores are usually attached to the supply train. In addition to the above supplies for field service there is maintained at depots in the rear what is known as the depot reserve, sufficient in quantity to complete, with the reserve for field service and permanent camp, one year's supply for the army at war strength.

The word "reserve" is also applied to detachments of troops kept back or held in reserve for the purpose of securing the victory or reënforcing a threatened point. For example, there is the reserve of the advance guard, of the rear guard, of the outpost (q.v.); in combat, the local reserves of regiments and brigades; and finally the general reserve, which is the large body of troops kept in hand behind the firing lines to be used at the critical moment of the action.

The term is also applied to classes of individuals who have received military training under either the compulsory or the volunteer system in time of peace, have returned to their civil pursuits, but are still available for military service in case of war. The individuals of these classes are all known as "reservists," but have different degrees of training. In the British army before the outbreak of the Great War in 1914 the reserve troops formed three classes, the regular reserve, the auxiliary forces, and the irregular forces. The auxiliary forces were made up of territorials and the special reserve. (See *Army* under United Kingdom.) The initial failure of Great Britain to play a more prominent part in the great struggle on land in 1914–15 was due to the lack of trained reservists, which lack may be ascribed to her traditional volunteer system.

In the United States a regular-army reserve was created by Act of Congress dated Aug. 24, 1912. The operation of this Act only began to be felt in the latter part of 1915, since the provisions of the Act required three or four years' service with the colors and four or three years with the reserve. Competent military critics were skeptical about the efficacy of this attempt to produce a reserve in sufficient numbers to have any appreciable effect in case of a great war. The only other so-called reserves available in the United States are the National Guard organizations and such volunteer troops as may be raised and trained after the outbreak of war.

For reserve in all armies, see *Army* under the titles of the different countries; also Armies and Army Organization; Arsenal; Conscription; Depot; Landsturm; Landwehr; Militia; Volunteer.

RESERVE BANK, Federal. Under the Banking Act of Dec. 23, 1913, 12 reserve districts were created and Federal reserve banks were established in the following cities: Boston, New York, Philadelphia, Cleveland, Richmond, Atlanta, Chicago, St. Louis, Minneapolis, Kansas City, Dallas, San Francisco. In these Federal reserve banks each national bank of the corresponding district is required to take stock to the extent of 6 per cent of its paid-up capital and surplus. State banks also are permitted under similar conditions to take stock in the Federal reserve bank, provided that they submit to requirements as to reserve, etc., similar to those of the national banking system. Each Federal reserve bank has nine directors, three representing the banks of the district, three representing commerce, agriculture, and industry, and three representing the government and appointed by the Federal Reserve Board. The latter body, which has ultimate control over the system, consists of the Secretary of the Treasury and the Comptroller of the Currency, ex officio, and of five members named by the President with the advice and consent of the Senate.

The function of the Federal reserve banks is to mobilize the reserves of the banking system and to provide means for united action in time of crisis. They are bankers' banks, and have no direct dealings with the public. Reserves deposited with them by member banks afford a basis for a business in acceptances and rediscounts for member banks. Each member bank has a right to rediscount with the reserve bank short-term paper of approved grades, and thereby is enabled to draw upon the resources of the reserve bank when it is in danger of becoming overloaned. The Federal reserve banks are also lawful depositories of government surplus funds, and through his control of the deposit of such funds the Secretary of the Treasury may enable any regional bank to make more liberal provision for rediscounts within its district than its bank reserve funds would permit. The position of the reserve banks is further strengthened by the power to issue notes on the security of commercial paper, against which they are required to hold a gold reserve of 40 per cent.

The business of rediscounting, to which the Federal reserve banks are adapted, is developing very slowly in the United States. In its first two years of operation the Federal reserve system has served chiefly the psychological purpose of giving to the credit institutions assurance of relief in case of need. The following statement for Dec. 4, 1915, exhibits the business condition of the system:

RESOURCES

Gold reserve	$325,181,000
Legal-tender notes, silver, etc.	32,681,000
Bills discounted and bought	51,356,000
United States bonds	13,875,000
Municipal warrants	17,821,000
Federal reserve notes	18,118,000
Due from Federal reserve banks	19,775,000
All other resources	6,552,000
Total	$485,359,000

LIABILITIES

Capital paid in	$54,859,000
Government deposits	15,000,000
Reserve deposits	392,966,000
Federal reserve notes	13,969,000
All other liabilities	8,565,000
Total liabilities	$485,359,000

See Bank, Banking, *Banking Reform;* Rediscounting. Consult Willis, *The Federal Reserve* (New York, 1915), and the *Federal Reserve Bulletin,* issued by the Federal Reserve Board (Washington, 1915).

RESERVE, Naval. See Naval Reserve.

RESERVED CASES. A term applied in the Roman Catholic church to sins of a heinous character, such as heresy, simony, and sacrilege, that for their adequate treatment require the attention of an ecclesiastic superior to the parish priest, either the Pope, the bishop, or the head of an order. Consult Hausmann, *Geschichte der päpstlichen Reservatfälle* (Regensburg, 1868), and Thomas Slater, *Manual of Moral Theology* (New York, 1909).

RESERVOIR, rĕz′ĕr-vwôr. See Dams and Reservoirs; Water Works.

RESHID PASHA, re-shēd′ pȧ-shä′, Mustapha Mehemet (1802–58). A Turkish statesman and long the chief of the Party of Progress in Turkey, born at Constantinople. In 1833 he negotiated the Treaty of Kutaia with Mehemet Ali (q.v.), the rebellious Viceroy of Egypt. In 1837 he was made Prime Minister and aided the Sultan Mahmud II in carrying out his plans for the reform of the administration; but the Old Turkish party forced him out of his office before the close of 1838. After this he was sent as Envoy to London, Berlin, and Paris. On the death of Mahmud II, in 1839, when the Ottoman throne was tottering under a fresh onslaught by Mehemet Ali, Reshid Pasha was again called to take charge of the Foreign Office by the mother of the young Sultan, Abd-ul Medjid. He succeeded, in 1839, in obtaining a constitutional charter, which, however, soon became a dead letter. His foreign diplomacy checked Mehemet Ali in Syria through the intervention of the Quadruple Alliance (Great Britain, Austria, Prussia, and Russia), but a seraglio intrigue led to his dismissal. From 1841 to 1845 he was the Turkish representative at the French court. In 1845 he was once more made Foreign Minister, and in 1846 he was appointed Grand Vizier. He was repeatedly deposed, and almost immediately recalled, according as the antireform party gained or lost the favor of the Sultan; but the complications with Russia which arose in 1853 threw the antireformers into discredit, and Reshid Pasha, more powerful than ever, was again recalled to the direction of foreign affairs. In 1855 he again retired from office, which he did not resume till after the Peace of Paris.

RESHT, rĕsht. The capital of the Province of Ghilan, Persia, situated near the southwest shore of the Caspian Sea, 150 miles northwest of Teheran (Map: Asia, Central, C 4). The houses are tiled and neatly built and the streets are paved. There are a vast ruined palace, numerous caravansaries, large bazars, and about 1200 shops and warehouses. Indian wares are imported from Balfrush in Mazanderan, and European manufactures from Russian Armenia. Resht is the chief entrepôt for the Persian silk trade. Extensive manufactures of shawls and carpets are carried on and there are oil deposits in the neighborhood. Pop., between 30,000 and 40,000. Enzeli, the port of Resht, on the Caspian Sea, about 18 miles distant, has 1500 inhabitants.

RESICZABÁNYA, rĕ′shĭts-ŏ-bän′yŏ. A mining town in the County of Krassó-Szörény, Hungary, about 50 miles southeast of Temesvár. There are extensive iron and coal mines and iron works in the vicinity. Pop., 1900, 11,770; 1910, 12,578.

RESIDENCE, rĕz′ĭ-dens (ML. *residentia*, from Lat. *residere*, to reside, remain, from *re-*, back + *sedere*, to sit; connected with Gk. ἕζεσθαι, *hezesthai*, OChurch Slav. *sēsti*, Skt. *sad*, Goth. *sitan*, OHG. *sizzen*, Ger. *sitzen*, AS. *sittan*, Eng. *sit*). The obligation to perform in person the duties of a benefice whose revenue was enjoyed. It was early a complaint that this obligation was violated. The Council of Sardica (347) in its twelfth canon enjoined upon bishops and in the sixteenth upon presbyters the duty of continuous service in their proper residence. The evil continued, however, and the Council of Trent endeavored to remedy it by providing in its twenty-third and twenty-fourth sessions that no prelate should absent himself from his diocese more than three months except for urgent cause. In present practice in the Roman Catholic church parish priests cannot be absent longer than one week from their cure, except with the permission of the bishop, which will not be given for more than two months in the year except for urgent reasons.

RESIDENTIAL DISTRICTS. See HOUSING PROBLEM; TOWN PLANNING.

RESIDUAL (rē-zĭd′ū-al) **CALCULUS.** See CALCULUS.

RESIDUAL ROCKS (from Lat. *residuum*, remainder, from *residere*, to reside, remain). Rocks which have been produced through the decomposition and disintegration of rocks belonging to any of the larger divisions, viz., sedimentary, igneous, and metamorphic rocks. The agents which bring about these changes are in part chemical and in part physical. The active agents of chemical change at the surface of the earth are oxygen, water, and carbonic acid, all of which exist in the atmosphere and in the waters which percolate within and near the earth's surface, and the changes which they bring about are chiefly oxidation, hydration, and carbonization. The new minerals which are developed by these processes may be said to be in general lighter in weight (more bulky) and more soluble than the minerals out of which they have been formed. They are also as a class softer, and possess for the most part a fibrous or scaly texture. Particularly through the change in volume which this recrystallization involves, a physical force is brought into play which opens fractures in the rock and permits of its solution and disintegration. The more soluble constituents of the rock are taken in solution and removed, while the less soluble materials remain as a more or less incoherent mass constituting the residual-rock type. The residue from rocks of igneous and generally granitic types has been given various names such as waste, geest, Gruss, etc. In unglaciated regions residual rocks of this type occasionally possess their original textures, lacking only the compactness characteristic of those types. Where situated on steep slopes the upper portions of the deposit of waste will by the force of gravitation slide down towards the valley, a process which is described as creep. In glaciated regions, on the contrary, the surface layers of waste have been carried away by the ice mantle and the hard underlying rock has usually also been planed down. The comparative recency of the glacial epochs in a geological sense thus furnishes a certain measure of the time necessary to decompose and disintegrate compact rock masses. The final product of decomposition and disintegration of granitic rocks is a fine clay, or kaolin, and this has been the source of the great deposits of porcelain clay throughout the world. Before this final stage of the alteration has been reached the residual rock has usually the structural peculiarities of a coarser or finer sand, and thus we have the residual sand of granite, etc. Calcareous rocks, such as limestone or dolomite, furnish in the initial stages of their solution and disintegration a granular calcareous sand. Joints and other fissure planes in massive rocks greatly facilitate the processes of decomposition and disintegration. The solutions which are active in these processes find their way along the joint planes as trunk lines, and by their more ready access to the edges and corners of included blocks of rock soon produce a spheroidal and often concentric structure. Thus are brought about spheroidal blocks of the igneous-rock type, the centres of which are usually little changed, but the peripheral zones of which represent altered phases of the rock, the outermost being the most nearly disintegrated.

RESIDUARY (rė̄-zĭd′ṻ-å-rĭ) **LEG′ACY.** A legacy of all that remains of an estate after the debts and specific legacies have been paid. Where a testator desires to give the bulk of his estate to one person and at the same time to make other smaller bequests, it is customary to make the latter by means of express or specific legacies, naming the amount or specific property, and then to devise and bequeath all the "rest, residue, and remainder" of his estate to the favored person by a residuary clause. It sometimes happens, however, after the debts and minor specific legacies are paid, that the estate is exhausted, and the one whom the testator most intended to favor gets nothing. The best method of guarding against this contingency is to put a condition in each of the specific legacies to the effect that it shall be null and void if the appraised value of the estate is not in excess of a certain sum, or to make an express or specific bequest to the person who is to take precedence over the others, then make the other minor bequests, and conclude by making the first person the residuary legatee of the rest of the estate. See LEGACY; WILL.

RESINA, rå-sē′nȧ. A town in the Province of Naples, Italy, on the Gulf of Naples, at the foot of Vesuvius, 5 miles by rail southeast of Naples (Map: Italy, G 1). It is on the site of ancient Herculaneum. Exquisite fruits are grown, and the famous Lachryma Christi wine is made in the vicinity. There are manufactures of silk, glass, and leather. The town is surrounded by country houses, and is a place of recreation for the Neapolitans. The ascent of Mount Vesuvius is begun at Resina. Pop. (commune), 1901, 19,766; 1911, 20,152.

RESINS, rĕz′ĭnz (OF. *resine*, Fr. *résine*, from Lat. *resina*, resin, perhaps from Gk. *ῥητίνη*, *rhētinē*, pine resin). A class of solid or semisolid substances mostly of vegetable origin. The series include many minerals which are assumed to be the product of extinct vegetation and are known as fossil resins.

Resins are allied to the volatile oils with which they are found combined in the plant, as oleo resins. Although widely divergent in chemical behavior, the resins contain only the elements carbon, hydrogen, and oxygen combined in such a confusing variety of forms that it is impossible to make any scientific classification. It seems highly probable that the present system will be abandoned and the different members related to the specific forms of compounds to which they belong. The following are the general characteristics of the resins: at ordinary temperatures they are solid, translucent, and for the most part colored, although some are colorless and transparent. A few are devoid of odor, while others give off an aromatic fragrance due to the admixture of volatile oil. In the crude state they are noncrystalline and brittle, breaking with a conchoidal fracture; when pure several of them may, however, be obtained in the crystalline form. They melt at low temperatures and are inflammable, burning with a white smoky flame. Resins are insoluble in water, soluble in alcohol, ether, and various oils. They are nonconductors of electricity at ordinary temperature, but become charged with negative current by friction. Many of them possess acid properties, in which case their alcoholic solutions redden litmus. These resins combine with the alkalies and form frothy, soaplike solutions in alkaline lyes. The resinous soaps thus formed differ from ordinary soap in not being precipitated by sodium chloride.

Oleoresins are generally obtained by making incisions into the wood of trees which produce them; sometimes, however, they exude spontaneously, and in other cases require to be extracted from the wood with hot alcohol or other solvents. The crude resins are separated from the volatile oils by distillation, and from the gummy and mucilaginous matters with the aid of alcohol, which dissolves the pure resins.

Among the resins largely employed for varnish making are the natural and fossil copal obtained from Sumatra, Java, and the Philippines; dammar, from the same localities; amber and a series of fossil resins of asphaltic nature from various coal measures. An interesting resin, urushic, is one obtained by the Japanese and used in their lacquer. Ki-urushi (raw lacquer) is collected from the milky secretion of the *Rhus vernicifera*. According to Yosheida it contains urushic acid, gum, water, and a peculiar diastatic matter, together with traces of a volatile poisonous body. The phenomenon of drying is due to the oxidation of urushic acid, $C_{14}H_{18}O_2$, through the agency of the diastatic matter in the presence of oxygen and moisture. The poisonous body affects the skin in the same manner as the poison ivy.

Resins also form important constituents of the substances known as gum resins (see GUMS) and are contained in the so-called balsams, a class of liquid or semisolid products including benzoin, storax, and the balsams of Peru and Tolu. Resins containing benzoic or cinnamic acid are sometimes spoken of as solid balsams. The common resin or rosin of commerce exudes in a semifluid state from several species of pine, being derived chiefly from the *Pinus australis* and the *Pinus pinaster*. The crude turpentine (an oleoresin) obtained from these trees is distilled by steam, yielding from 17 to 34 per cent of volatile product known as turpentine or "turps" and a residue of resin, a brittle solid somewhat heavier than water. Common rosin, melting point 100–140° C. (212–284° F.), specific gravity 1.08, consists largely of abietic anhydride, $C_{44}H_{62}O_4$, readily changed to abietic acid, $C_{44}H_{64}O_5$. Three grades of rosin are known in trade: virgin, made from the earliest exudations from the tree; yellow dip, the next runnings and by far the largest in yield; and hard, made from scrapings from the tree after the crude turpentine has ceased running. White rosin contains water; on its removal the color returns. Rosin is largely employed in cheap varnishes, soap, as a flux, as an adulterant of fats, waxes, and hydrocarbons, in ship calking, manufacture of resin lakes, printing inks, etc. By destructive or dry distillation rosin yields a liquid product consisting of two compounds, rosin spirit and rosin oil. Rosin spirit boils below 360° C. (680° F.), resembles turpentine, and is often used in admixture. Rosin oil, a heavy oil boiling above 360° C. (680° F.), after purification with sulphuric acid and lime water, is redistilled. By mixing with milk of lime, rosin grease (axle grease) is produced. Rosin oil is used as an adulterant for linseed and other oils. Colophony, copaiba, jalap, podophyllum, and the resin of scammony are used in medicine. Colophony, or rosin, is an antiseptic and forms an excellent application for wounds and ulcers. Copaiba acts as a stimulant and disinfectant and is often prescribed in gonorrhœa. Podophyllum, jalap, and the resin of scammony are purgatives, the latter causing profuse watery evacuation of the bowels.

Consult: Georg Theniüs, *Die Harze und ihre Producte* (Vienna, 1879); J. Cameron, *Oils and Varnishes* (London, 1886); A. Tschirch, *Die Harze und die Harzbehälter* (Leipzig, 1900); F. H. Thorp, *Outlines of Industrial Chemistry* (New York, 1911); Sir E. Thorpe, *Dictionary of Applied Chemistry* (London, 1913); Harry Ingle, *Manual of Oils, Resins, and Paints,* vol. i (Philadelphia, 1915).

RESIN WEED. See Compass Plant.

RESIST′ANCE, Electrical. That property of a conductor which determines the intensity of an electric current flowing through it for a given constant difference of potential at its terminals. The resistance of a conductor varies with its temperature, but is the same for all currents. The unit of resistance, the ohm (q.v.), is such a resistance as will allow a current of one ampere to flow through a conductor when there is difference of potential of one volt between its terminals. This relation is given by Ohm's law that $C = \frac{E}{R}$, where C stands for the current, E for the electromotive force, and R for the resistance. The resistance of a homogeneous conductor will vary directly as its length and inversely as the area of its cross section, or in the case of a round wire inversely as the square of the diameter. Specific resistance is the resistance of a centimeter cube of a substance. Resistance may be measured by means of the Wheatstone bridge (q.v.) or by substituting known resistances for unknown, so as to produce an equivalent current, which is indicated by the deflection of the galvanometer (q.v.). Another method is to use the differential galvanometer and so arrange the known resistances that the same current flows through each set of coils; while there are also methods where use is made of the condenser and ballistic galvanometer.

It is a general property of solid conductors that as their temperature is lowered their electrical resistance decreases. As a temperature of — 273° C., i.e., "absolute zero," is approached, the resistance becomes minute. In some experiments performed in 1914 by Professor Onnes, of Leyden, at the temperature of liquid helium, an electrical current once produced in a coil of wire continued practically undiminished for many hours, in spite of the fact that there was no cell or source of E. M. F. acting.

See Conductor; Electrical Units; Electricity; Ohm.

RES JU′DICA′TA (Lat., thing adjudged). In law, a matter of controversy which has been finally decided and determined on its merits by a court of competent jurisdiction. This implies that there has been no fraud or collusion by which the court has been misled. The importance of this doctrine lies in the fact that if a matter is once judicially determined it cannot again be litigated by and between the parties to the former litigation. To make the entire subject matter of an action *res judicata* all the parties interested must be made parties thereto, either as plaintiffs or defendants. Only the points actually decided come within this rule. See Jeopardy; Judgment.

RES′OLU′TION. In law, an act or official expression of the will of a legislative body, corporation, or organized assembly. The term is sometimes used as being synonymous with ordinance, when applied to an act of a municipal council or a board of aldermen. However, resolutions are usually adopted to authorize ministerial acts or to express the sentiment or regard of a body, whereas ordinances are passed to prescribe permanent rules of conduct or law.

In the civil law the discharge of a valid contract by consent of the parties or by decree of a court is said to be a resolution of the contract. This is distinguished from a rescission, which implies that the contract was void ab initio.

RES′ONANCE (OF. *resonnance,* Fr. *résonnance,* from Lat. *resonantia,* echo, from *resonare,* to sound back, from *re-,* back again, anew + *sonare,* to sound, from *sonus,* sound; connected with Skt. *svan,* to sound). A general mechanical property which has many illustrations in nature. If a large bell is to be set in motion, it is only necessary to apply a series of impulses regularly timed at intervals to correspond with the natural period of the body. The column of air in a bottle or tube may be set in vibration by waves whose period is the same as that of the column of air. If a train of ether waves passes through some material medium the minute portions of which have a frequency the same as that of the waves, it will set these portions of matter vibrating. The waves thus lose energy, which is gained by the matter. Resonance applies in all forms of wave motion and especially in electromagnetic waves, where in wireless telegraphy the proper tuning of the circuit is an essential. See Absorption of Waves; Radiation; Wireless Telegraphy.

RES′ONA′TOR. A device used in acoustics (q.v.) to reënforce or strengthen a given tone. Resonators, which are used largely in the analysis of sound, consist of hollow vessels usually bulb-shaped or cylindrical. The air of such a vessel has a natural period of vibration, and when the resonator is brought near a sounding body which is emitting waves of the same frequency the former will take up the vibration and will emit the sound. In analyzing sound which is made up of numerous harmonics or overtones the resonator will select a particular sound, which it will reënforce. Resonators like wooden boxes are frequently used to mount tuning forks, and are constructed of such dimensions that contained air will vibrate in unison with the fork and strengthen the sound.

RESORCIN, rĕz-ôr′sĭn, or **RESORCINOL,** rĕz-ôr′sĭ-nōl (from *res-in* + *orcin*), $C_6H_4(OH)_2$. A diatomic phenol first obtained by Hlasiwetz and Barth in 1864 by fusing resins with potassium hydroxide. It has since been obtained by various other reactions. On an industrial scale it is made by fusing the sodium salt of meta-benzene-disulphonic acid with caustic acid, resorcin being thus produced according to the following chemical equation:

$$\underset{\substack{\text{Sodium}\\ m\text{-benzene-}\\ \text{disulphonate}}}{C_6H_4(SO_3Na)_2} + \underset{\substack{\text{Caustic}\\ \text{soda}}}{2NaOH} = \underset{\text{Resorcin}}{C_6H_4(OH)_2} + \underset{\substack{\text{Sodium}\\ \text{sulphite}}}{2Na_2SO_3}$$

The mixture is acidified with hydrochloric acid, and the resorcin is separated by means of ether or some other liquid in which it is soluble. The crude resorcin thus obtained is purified by distillation. It may be added that the meta-benzene-disulphonic acid used in making resorcin is obtained by heating benzene with fuming sulphuric acid. Pure resorcin is a colorless crystalline substance melting at 119° C. (246.2° F.) and boiling at 276.5° C. (529.7° F.). It has a faint odor and a sweetish taste, but leaves a disagreeable pungent aftertaste. It is freely soluble in water, alcohol, ether, benzene, amyl alcohol, glycerin, and other organic liquids. Resorcin is largely used in the arts for the preparation of phthalein dyes, such as fluorescein, eosin, etc.; it is also employed in the manufacture of azo colors. It is often used in medicine. When applied externally it has the effect of removing scales in chronic skin diseases; it is an excellent remedy for dandruff, a mixture of resorcin and glycerin being best employed for this purpose.

RESORCIN YELLOW. See COAL-TAR COLORS.

RES′PIRA′TION (Lat. *respiratio*, from *respirare*, to breathe), ARTIFICIAL. The exchange of air as in natural breathing (see RESPIRATION, ORGANS AND PROCESS OF), produced by mechanical means. Respiration is suspended when for any reason the muscles concerned in breathing are deprived of their wonted nervous stimulation by poisoning of the nerve centres which govern them. This may take place in asphyxiation by poisonous gases, in drowning, poisoning, or by prematurely cutting off the placental circulation during parturition, and it is in these circumstances that artificial respiration finds its greatest usefulness. (See ASPHYXIA.) The object in resuscitation (q.v.) is to imitate as closely as possible the natural respiratory movements. These should be rhythmical and at the rate of 12 or 14 to the minute. Several methods of carrying on artificial respiration have been devised. Of these the most generally useful is that of Sylvester. In this method the body of the person to be revived is placed upon the back, the shoulders being slightly elevated and high enough to keep the chin from falling forward on the chest. The arms are then grasped just above the elbows and raised upward and forward to their full extent and at the same time rotated slightly outward. This position is maintained for two or three seconds and secures inspiration. The arms are now lowered and pressed firmly against the sides of the chest, thus bringing about expiration. These movements are repeated in alternation with regularity and precision at the rate above mentioned. Before proceeding with artificial respiration in cases of drowning certain preparations have to be made. To drain off water from the stomach and chest, the patient is stripped to the waist and placed face downward with the pit of the stomach raised above the level of the mouth by a roll of clothing or other material placed transversely beneath the trunk. Pressure is then made upon the patient's back. The tongue must be held out, the larynx kept open, and the mouth and throat cleared of mucus. Efforts to resuscitate should be continued for at least an hour, apparently inanimate individuals having been brought to life at the end of that time, after having been immersed half an hour or longer. Attempts to restore respiration should be supplemented by friction, the administration of stimulants, and the application of heat to the abdomen and lower extremities.

Schultz's method, applicable especially to the resuscitation of newly born infants, is as follows: The operator stands behind the patient. The shoulders are grasped, with an index finger in each armpit, the thumbs over the shoulders, and the rest of the fingers resting obliquely over the back. The whole weight of the child's body is now allowed to hang from the shoulders. This lifts the ribs, expands the chest, and produces mechanical inspiration. Expiration is produced by swinging the child forward at arms' length to a point where the lower limbs and pelvis topple over towards the operator, thus bringing about extreme flexion of the trunk and forcing the abdominal viscera against the diaphragm. This motion is then reversed, and the process repeated at the rate of eight or nine times a minute.

In the method of Byrd-Dew the neck is supported by one hand, the thighs upon the other, the child lying upon its back. The head is allowed to fall backward so that the glottis may remain freely open. The body is then alternately extended and flexed, which movements determine respectively inspiration and expiration.

Fell's method of artificial respiration consists in pushing a tube into the larynx and trachea and forcing warmed air into the lungs by means of a bellows. Expiration is secured by pressure on the sides of the chest.

Marshall Hall's method consists in placing the patient on one side and alternately rolling him face downward to compress the chest and on his back to allow the elasticity of the ribs to expand the chest.

Laborde's method depends on rhythmical traction of the tongue. This organ is seized, as far back as possible, between the thumb and index finger wrapped in linen, and alternately pulled forcibly forward and relaxed. This method is supposed to excite breathing by reflex action.

A practicable and very useful method especially for young children is mouth-to-mouth insufflation. A piece of gauze is laid over the mouth of the child and air breathed directly into its lungs from those of the operator. Consult C. A. Lauffer, *Resuscitation* (2d ed., New York, 1915). See PULMOTOR.

RESPIRATION, IN PLANTS. A series of processes by which plants release the necessary energy for growth, movement, and similar work. Although the true nature of respiration in plants was stated by Ingenhouss before the beginning of the nineteenth century, and its relation to growth and the evolution of heat was clearly set forth by De Saussure in 1804, confusion between photosynthesis and respiration has persisted to the present day.

The method of obtaining energy in the presence of free oxygen by oxidizing and decomposing materials within the body is known as normal respiration. Respiration in absence of oxygen is spoken of generally as anaërobic and in higher plants more specifically as intramolecular. In some organs of higher plants intramolecular respiration is almost entirely alcoholic fermentation, and it is generally closely related to some type of fermentation.

Under ordinary conditions almost all plants are able to absorb free oxygen from the atmosphere at all times. But if the absorption of free oxygen is impossible, intramolecular respiration sets in as a poor substitute for normal respiration, for in terms of material decomposed the energy released is only a fraction of that released in the latter process. Either because of the lack of sufficient energy or because of the formation of poisonous materials by the process, intramolecular respiration will not generally support growth or even life for any considerable period. Some bacteria are able to live and grow only in the complete absence of free oxygen and are known as obligate anaërobes. They decompose nitrates or sulphates as a source of oxygen or ferment organic material as a source of energy. Organisms that can grow either in the presence or absence of free oxygen are known as facultative anaërobes. All other organisms thrive only in the presence of free oxygen, although they continue a modified respiration in its absence.

Normal respiration consists essentially of four independent processes: first, the absorption of oxygen; second, the union of oxygen with the substances to be oxidized; third, the decomposition of these substances, with the formation of various end products, differing according to circumstances; fourth, the elimination of these products. The intensity of respiration in plants varies greatly with different plant groups, different individuals of the same species, different organs of the same individual, and different stages of development of the same organ. Succulents and shade plants have low respiratory rate, while many fungi show more intense respiration than warm-blooded animals. Flowers, young organs, germinating seeds, and buds have more intense respiration than mature roots, stems, and leaves. Sufficient reduction of oxygen reduces normal respiration or even induces intramolecular respiration. Very slight reduction is thus effective in many seeds that are already limited in oxygen supply by membranes of slight permeability, while reduction to one-fifth or less of the normal atmospheric pressure is necessary in other organs. Under increased pressure the results differ according to the duration of exposure. For a short time plants may respire normally at two to six atmospheres of pure oxygen. Under a longer exposure to such pressures respiration is likely to be retarded. Variations in temperature, which are frequent in nature, exert a marked effect upon the intensity of the process. Within certain limits this follows the Van't Hoff law, showing a rise of two to three fold for each 10° C. rise in temperature. At certain higher temperatures, varying from 20° C. to 40° C. in the forms studied, an inhibitory effect of temperature sets in, which increases with time and more or less counteracts the accelerating effect. As the temperature rises, this time factor becomes more prominent. This critical point is higher in starchy than in protein-rich seeds and in tropical than in temperate forms. The rate of photosynthesis, growth, geoperception, and other plant processes is similarly modified by temperature. This probably means that the rate-determining phase of these processes is a typical chemical reaction, such as occurs in a test tube. The nature of the time factor is not known, but it may be a coagulation of cell proteins or some similar process.

Intramolecular Respiration. The exclusion of oxygen from plants which normally use it produces a profound disturbance of the usual metabolism, as shown by the fact that the end products of respiration, instead of being chiefly carbon dioxide and water, are alcohol, hydrogen, organic acids, etc. For most plants a period of intramolecular respiration seems to be a time to be tided over, growth ceases, and most other functions are suspended. After poisonous materials have accumulated to a certain extent death ensues. Therefore at high temperatures, which accelerate the process, intramolecular respiration suffices to maintain life for a shorter time than at low temperatures. See FERMENTATION.

RESPIRATION, ORGANS AND PROCESS OF. The two great objects of respiration are: (1) to supply that amount of oxygen to the body which is essential to its economy, and (2) to remove the carbon dioxide which has been produced as a waste product. We may consider the anatomical details of the respiratory process in man and mammals under three different heads. First, there must be a special respiratory organ, the lungs, affording an immense extent of internal surface, covered by a vascular network, through which the blood flows in innumerable minute streamlets, only separated by an extremely thin membrane from the atmospheric air that has been inhaled; secondly, there must be such an arrangement of the circulating system that fresh blood may be continually driven through the lungs and then onward to the general system; and thirdly, there must be provision for the frequent and regular change of air contained in the lungs. The special organs of respiration consist of the larynx, the trachea, the bronchi, and the lungs. For a description of the first two, see LARYNX; TRACHEA.

The two bronchi resemble the trachea in structure except that the incomplete rings are distributed on all sides of the tubes. The bronchi on entering the lungs divide into smaller and smaller branches until finally each minute branch terminates in a pulmonary lobule. The smaller bronchi, as they are called, lose their cartilaginous rings, and the circular or transverse muscular layer forms a distinct coat. The mucous membrane is very delicate and lined with ciliated epithelium. Within the lobules of the lung the smaller bronchi divide still further into more minute branches, and their structure becomes more delicate, until at last they consist of only a thin membrane lined by a single layer of squamous epithelium and finally terminate in small saclike dilatations which are the air cells of the lungs. These air cells are from $\frac{1}{200}$ to $\frac{1}{300}$ of an inch in diameter. Their walls are lined by a single layer of flattened cells. The air vesicles of one lobule do not communicate with those of another nor even with those of adjacent intercellular passages, as a rule. Therefore any obstruction of a bronchus cuts off the supply of air to the lobule beyond. Elastic tissue fills in the space between the air cells, and within this elastic tissue ramifies a dense network of capillary blood vessels. It is here that the interchange of gaseous elements between the atmosphere and the blood takes place.

The pulmonary lobules are bound together by connective and elastic tissue to form larger structures called lobes. Of these lobes the right lung presents three and the left two. Each lung is enveloped by a serous covering, the pleura, which is reflected from the lung at the point where the bronchus and great blood vessels enter and passing outward line the cavity of the chest. (See Pleura; Pleurisy.)

In consequence of the great number of air cells which constitute their substance (over 600,000,000, it has been calculated), the lungs (except in the fœtal state, when no air enters them) are the lightest organs, in relation to their size, in the body. Although their bulk is so great that, with the heart, they occupy almost the whole of the cavity of the chest, they weigh only about three pounds and a half in men and two pounds and three-quarters in women. Their color varies at different ages. At birth they are of a pinkish-white tint, in adult life they are of a slate color and present a mottled appearance, and in old age they become of a still darker tint. The polygonal markings which are seen on the surface correspond to the outer surface of the lobules already noticed. Their shape is adapted to that of the cavity in which they are lodged, each lung being conical in form, with its apex rising into the neck, while its base, which is broad and concave, rests upon the convex surface of the diaphragm; and between the two lungs lie the heart and the great vessels that proceed from it. During life, except in certain diseases, as, e.g., pericarditis (q.v.), the inner margins of the lungs nearly overlap the heart, leaving only a roundish space of that organ, less than 2 inches in diameter, uncovered, while their lower borders extend to the cartilages of the ribs and fit into the angle formed between those cartilages and the diaphragm.

For the method by which the blood is perpetually changed in the lungs, see Circulation.

For a description of the shape and framework of the chest, see Chest. The chest, or thorax, is so constructed as to be capable of enlargement in height (vertically), in depth (or from the front backward), and in width (or from side to side). Its height is increased mainly by the descent of the diaphragm and to a certain extent by the elevation of the ribs and the widening of the intercostal spaces, while its depth and width are increased by the elevation of the ribs, which carry forward and elevate the breastbone (or sternum), especially at its lowest end, and are slightly rotated on an imaginary axis, joining their extremities, by which their central portion is raised and slightly removed from the mesial plane of the chest. It is only in forced or deep inspiration that all these means of enlarging the chest are called into play. An ordinary inspiration is attended in men with very slight elevation of the ribs (about $\frac{1}{20}$ of an inch), while in women the elevation is much greater, especially in the upper ribs, the cause of this difference in the sexes probably lying in the narrower waist of the female requiring a compensation in the upper part of the chest. There are three varieties of ordinary respiration, viz., (1) abdominal, or that chiefly effected by the diaphragm and seen in the motion of the walls of the belly; (2) costoinferior, or that in which the seven lower ribs are observed to act; and (3) costosuperior, or that effected in a considerable degree by the upper ribs. The first variety occurs in infants up to the end of the third year; the second in boys after the age of three and in men; and the third in adult females.

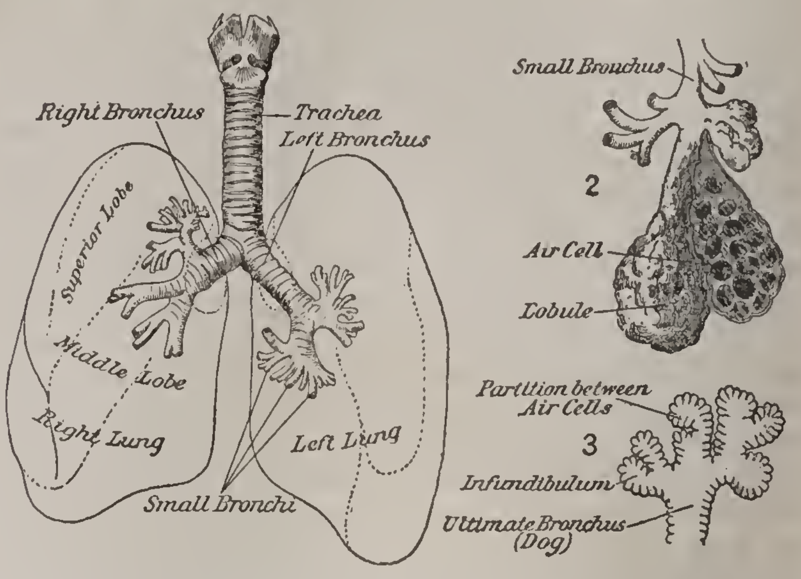
The following points in connection with the respiratory movements require notice. Every complete act of respiration is divisible into two parts, viz., (1) inspiration and (2) expiration. Between these acts there is a short pause, not always observed. After expiration there is a long pause. The act of expiration is always more prolonged than that of inspiration, the former being to the latter in the ratio of 12 : 10 in adult males and as 14 : 10 in children, women, and aged persons. The number of respiratory acts performed in a minute varies at different ages. At birth there are 44 respirations in one minute; at 5 years of age, 26; from 15 to 20, 20; from 20 to 25, 18.7; from 25 to 30, 16; from 30 to 50, 18.1; so that from 16 to 20 may be taken as the ordinary range for healthy adults. The average ratio which the number of respirations bear to the number of pulsations in a given time is about 1 : 4½, and if there is any great deviation from this ratio there is probably some obstruction to the aëration of the blood or some disorder of the nervous system.

When the lungs have been emptied as much as possible of air by the most powerful expiratory effort, they still contain a quantity over which we have no control and which may be estimated at about 100 cubic inches. To this portion of the contents of the lungs the term "residual air" is applied. In addition to this residual air physiologists distinguish, in connection with the respiratory process, reserve air, which is that portion which remains in the chest after an ordinary gentle expiration, but which may be displaced at will; breathing or tidal air, which is the volume that is displaced by the constant gentle inspiration and expiration; and complemental air, or the quantity which can be inhaled by the deepest possible inspiration, over and above that which is introduced in ordinary breathing. The greatest volume of air that can be expelled by the most powerful expiration, which is obviously the sum of the reserve, breathing, and complemental air, is designated as the vital capacity. The average inspiration in a healthy man at rest is about 30 cubic inches, and this increases with exercise of any kind. When we consider that the amount of air taken in at each respiration is only about one-seventh the capacity of the lungs, we see how slowly the air is renewed; but the law of the diffusion (q.v.) of gases here comes in play, for, the air in the air cells and finer tubes being charged by the respiratory process with a great excess of carbonic acid, as compared with the inspired air contained in the larger tubes, a diffusion of the carbonic acid necessarily takes place in the outward direction, while the oxygen from the air, or the air itself, similarly diffuses itself in an opposite direction, towards and into the air cells themselves. The total amount of air which passes through the lungs in 24 hours must obviously vary with the extent and frequency of the respiratory movements. The total daily amount for a person at rest is 686,000 cubic inches. This quantity is largely increased by exertion.

The alterations in the inspired air effected by respiration consist essentially in the removal of a portion of the oxygen and its replacement by carbonic acid. The amount of carbonic acid in the expired air varies inversely with the number of respirations; it reaches 5.5 per cent (or more) when the respirations are only 6 in the minute, while it falls as low as about 2.6 per cent when the respirations are 96 in the minute. About 4.35 per cent of carbonic acid is, on an average, added to the air in ordinary respiration, while about 4.782 per cent of oxygen is removed, the actual diminution of bulk of the expired air (after the removal of the moisture obtained from the lungs) being about one forty-fifth of its volume. Hence, unless where there is free ventilation, the air in an apartment containing men or animals must soon become vitiated by containing a great excess of carbonic acid (for ordinary atmospheric air contains only about one part of carbonic acid in 2500 parts) and a deficiency of oxygen. The absolute quantity of carbonic acid (and consequently of carbon) exhaled in 24 hours is liable to great variations, caused by the temperature and moisture of the air, age, sex, muscular development, the nature and quantity of the food, muscular exercise, sleep, state of health, etc. Smith calculated that an adult man in a state of rest exhales in 24 hours an amount of carbonic acid equivalent to 7.144 ounces of carbon, and he estimated that it should be increased to 8.68 and 11.7 ounces for nonlaboring and laboring persons respectively at their ordinary rate of exertion; that the total amount of carbonic acid is greatly increased by external cold and diminished by heat; that it is increased by a moist and diminished by a dry atmosphere; that it increases in both sexes to about the thirtieth year, when it remains stationary for 15 years, after which it diminishes; that at all ages beyond eight years it is greater in males than in females and that it increases during pregnancy; that it is greater in robust than in slender men, the quantity of carbon expired per diem to each one pound of bodily weight being 17.07, 17.51, and 17.99 grains at 48, 39, and 33 years of age respectively; that it is greatly increased by eating and is diminished by fasting; that it is increased by muscular exertion; and that it is diminished during sleep. See MUSCULAR FORCE.

The nitrogen of the air plays no essential part in the process of respiration. The amount of watery vapor with which the exhaled air is saturated may range from about 6 to 27 ounces in 24 hours, its usual range being between 7 and 11 ounces. It is not pure water, but holds in solution a considerable amount of carbonic acid and albumenoid materials. See BRONCHITIS; PNEUMONIA; TUBERCULOSIS.

The anatomical divisions of the lungs, known as lobes, are composed histologically of an enormous number of little lobes or lobules. Each lobule is separated from surrounding lobules by connective tissue, and the lobules which come to the surface of the lung are often distinguishable as little polygonal areas. Each pulmonary lobule consists of a single terminal bronchus and the group of air cells and spaces connected with that bronchus. The terminal bronchus on entering a lobule divides into several branches known as alveolar ducts. These open into considerably larger cavities called infundibula, from the sides of which the air sacs or air cells open out like alcoves. The terminal bronchus is lined by a single layer of ciliated columnar epithelium. Outside of this are some elastic fibres and thin irregular bundles of smooth muscle cells. As the alveolar ducts are approached the ciliated epithelium is replaced by lower epithelium of the nonciliated variety. In the alveolar ducts the epithelium is cuboidal and the elastic tissue and smooth muscle are greatly reduced in amount. In the infundibulum the epithelium consists mainly of large flat nonnucleated cells known as respiratory epithelium. Among these are scattered smaller polyhedral cells which are remains of fœtal life and are called embryonal cells. Elastic tissue forms the supporting framework of the air sacs and forms a distinct ring around the mouth of each sac. In addition to the elastic tissue there is usually a small amount of fibrous connective tissue and some connective tissue cells surrounding the air sacs. Besides the parts just described, which may be considered as the parenchyma of the lung, there are seen in all sections of lung tissue bronchi of various sizes. The smaller bronchi are lined with a single layer of columnar ciliated epithelium lying upon a basement membrane. Beneath the latter is the stroma of the mucous membrane, outside of which is a circular layer of smooth muscle, the whole being surrounded by a connective tissue or fibrous coat. In the medium size and larger bronchi a distinct submucous coat is present in which are embedded the acini of mucous glands, while in the fibrous coat are situated various-sized plates of hyalin cartilage. In the largest of the bronchi the epithelium, instead of consisting of a single layer, is made up of several layers, and there is an increase in the thickness of the muscularis mucosæ and of the fibrous coat.



1, trachea and bronchi; 2, small bronchus, showing air cell and lobule; 3, ultimate bronchus of dog.

The blood vessels of the lung belong to two distinct systems: one, the bronchial system, is for the nourishment of the lung proper; the other, the pulmonary system, is for the purpose of exposing the blood to the air in the lungs. Both systems of vessels enter the lung at the hilus, accompanying the large divisions of the bronchus. Within the lung the pulmonary system of vessels gives off branches which correspond to the divisions of the bronchi and, on reaching the septa between the infundibula, break up into an extremely rich network of capillaries which surround the air sacs. At the margins of the air sacs the blood from the capillary network enters the radicles of the pulmonary veins, which accompany the arteries to the surface of the lung. The bronchial system of vessels accompanies the bronchial tubes and supplies capillary networks to them and to the other structures of the lung. The lymphatics of the lung, like the blood vessels, consist of two sets. One of these originates in the lymph spaces of the interlobular connective tissue and in the subpleural lymph spaces, communicating by means of the latter with the surface of the pleura. The second set, the bronchial lymphatics, originates in the subepithelial lymph spaces of the bronchi, which communicate with the mucous surfaces of the bronchi and air sacs. From these spaces definite lymphatic channels are formed which follow the blood vessels to the surface of the lung and pass thence by means of a few large trunks to the bronchial lymph glands. The nerves of the lung come from both cerebrospinal and sympathetic systems. The main nerve trunks enter the lung at the hilus and follow the branchings of the blood vessels and the bronchi. On arriving at the smaller bronchi the nerves break up into fine nonmedullated fibrils which pass to the muscular tissue and to the mucous membrane. Consult R. W. Allen, *Bacterial Diseases of Respiration* (Philadelphia, 1913), and H. H. Janeway, *Respiration* (New York, 1915). See BIRD, *Respiration in Birds;* CHEYNE-STOKES RESPIRATION; PULMOTOR.

RESPI'RATORY SOUNDS. Sounds produced during inspiration and expiration as perceived by auscultation, either by placing the ear upon the chest or through the medium of the stethoscope (q.v.). When the ear is placed upon the chest of a healthy adult, a soft, rustling sound is heard, comparable to the sighing of a gentle breeze among the leaves. This sound is louder and more marked during the inspiratory act, which is in health longer than expiration in the ratio of 6 to 5. To this sound the name "vesicular murmur" has been given. In certain areas of the chest, where the large bronchi are nearer the surface, viz., over the sternum, the junction of the first costal cartilage with the sternum, and a diamond-shaped space at the back in the middle line, the sound becomes tubular and higher pitched, and expiration and inspiration are of equal length. This is called bronchial breathing and is significant of disease when it occurs elsewhere than over the areas above indicated. Where these two sounds shade into each other, bronchovesicular breathing is heard.

In pathological conditions of the lungs the vesicular murmur undergoes many important modifications. It is, e.g., diminished or completely obliterated in pleurisy (q.v.) with effusion and in pneumothorax; it becomes louder and higher in pitch over consolidated lung tissue such as occurs in pneumonia and pulmonary tuberculosis (q.v.). One of the earliest physical signs of phthisis is a 'prolonged expiratory murmur,' and this alteration of the normal rhythm is also characteristic of asthma and emphysema (q.v.). Interrupted breathing, sometimes called cogwheel respiration, is heard in healthy but nervous individuals, but in disease it is caused by the breaking of the column of air passing through the bronchioles by tenacious mucus or by the expansion of different lobes at different times.

Certain adventitious sounds to which the generic name "râles" is applied are heard in disease and are produced either in the bronchial tubes or air vesicles. Dry râles are whistling, squeaking sounds, caused by the passage of air through bronchial tubes narrowed in places by swelling of the lining mucous membrane as in bronchitis, or by spasm, as in asthma, or by tough adherent mucus. Moist râles are produced by the expansion of previously closed air cells or by the passage of air through fluid in the bronchial tubes or in a cavity. These are heard in tuberculosis, the resolving stage of lobar pneumonia, pulmonary œdema, etc. Metallic tinkling is a sharp, quick sound resembling that produced by striking a glass vessel with a pin. Its occurrence gives evidence of the presence in the lung of a cavity of considerable size containing air and surrounded by firm walls. A friction sound is produced by the rubbing together of the visceral and parietal layers of the pleura when rough from inflammation, and is indicative of pleurisy. Consult Austin Flint, *A Manual of Auscultation and Percussion* (Philadelphia, 1912). See AUSCULTATION; PECTORILOQUY.

RESPIRATORY SYSTEM, COMPARATIVE ANATOMY OF THE. The system of organs that have the function, in the animal body, of taking in oxygen from the surrounding mediums (water and air) and of getting rid of carbon-dioxide gas and certain other excrementitious products. In Vertebrata these organs are either gills or lungs. In invertebrates the skin always functions, more or less, as a respiratory organ, and in addition various other organs subserve this function also. Whatever form or position the respiratory organ may assume, it must be richly supplied with blood vessels so that the blood containing carbon dioxide may come in close relation with the surrounding medium. No organ may be spoken of as a respiratory organ which has not this vascular apparatus. Specialized respiratory organs do not appear in the animal kingdom until the segmented worms are reached, and even in many of the segmented worms no specific respiratory apparatus is developed. The integument of lower forms and sometimes the wall of the intestine, when this organ is present, perform the respiratory function; the integument is better able to do so, since it is the part that comes most intimately in contact with the surrounding media.

In echinoderms there are no respiratory organs that are homologous throughout the phylum. In holothurians this function is performed by the respiratory tree, a mass of delicate branched tubules which open into the cloaca; by the oral tentacles; and by the entire body wall. In the other forms various other organs perform this function.

Mollusks, as a rule, have one (in a few cases more than one) pair of breathing organs, the gills, which are covered and protected by the mantle. In some forms this gill is wanting and in others it is functionally replaced by other and phylogenetically newer organs. Blood flows into these gills and after taking in oxygen from the water it flows back again, first to the heart and then to all parts of the body. The lamellibranch gills appear double on account of the strong development of the two rows of branchial leaflets, and in some mollusks increased surface is obtained by a folding of the leaflets. Scaphopoda and many Gastropoda do not possess true gills. In certain cases they are replaced by adaptive gills. The latter may be delicate leaflets forming a rosette around the anus, or folds to the right and left in the mantle cavity, or cerata, the dorsal finger-like processes of Nudibranchiata. Some Pulmonata have become adapted for aërial breathing. In this case the mantle cavity is richly supplied with blood vessels in its dorsal wall and gains a respiratory aperture, the so-called lung.

Respiration in all Crustacea takes place in the outer integument. In small Crustacea there are no specially developed respiratory organs, and respiration is performed by the entire body surface. In the large Crustacea certain parts of the body are adapted to perform this function more actively than others. To fit such parts of the body for a respiratory function folds of the integument arise, and the soft skin of the folds is functional in respiration. When this fold is transformed into a hard shield, it serves to protect the delicate breathing organs. The function of respiration is performed in most Crustacea by the thoracic limbs. Some of the crabs live more or less on land and are adapted to retain water in the branchial cavity and to breathe air directly. In the latter case the part of the branchial cavity that functions as a lung has its integument modified into branched tufts which project into the air cavity and are well provided with vascular organs.

The respiratory organs of insects are segmentally arranged air-conducting tubules, the tracheæ, which connect with the exterior by means of segmental openings, the stigmata. These openings are often guarded by bristles or tufts to keep out foreign particles. Internally the tracheal tubes branch and subdivide again and again and penetrate all through the tissues of the body. The tracheæ are lined by chitinous spirals to keep the tubes open. This chitin is continuous with the chitin of the exoskeleton and is shed with the latter.

In *Amphioxus* more than the first half of the length of the alimentary tract is devoted to the purposes of respiration, since its walls are provided with gill slits. This may be called the respiratory part of the alimentary tract (prosenteron) in contradistinction to the remainder, hinder portion, the digestive part. Gill slits to the number of 100, more or less, are borne by it. In Ammocœtes of the Cyclostomi, there is a muscular fold at the posterior end of the branchial part of the œsophagus. In *Petromyzon* that part of the œsophagus which contains the gills is entirely cut off from the alimentary tract and the cut-off end of the latter grows forward above the gill portion to join the mouth cavity. Thus two canals pass backward from the mouth. From Elasmobranchii onward the gills are in close relation with the skeletal parts of the visceral arches. As a rule teleosts possess four gill arches, but certain rudimentary gills on the mandibular and hyoid arches indicate that fishes formerly possessed more gill arches than at present. Fishes take in water through the mouth and, by a constriction of the latter, force it out through the gill slits. During the process of breathing the gill arches rise and fall. The Dipnoi, as the name indicates, breathe both by gills and by lungs. The lung sac of the Dipnoi is an unpaired bilobed sac.

Lungs. The air-bladder and lungs have a similar development and the latter has developed from the former. Both are outgrowths of the alimentary tract; the air bladder is usually formed on the dorsal, and the lung on the ventral, side, however. The point at which the air bladder arises from the œsophagus is not a fixed one, and the duct which connects the bladder with the œsophagus may remain open, may be reduced to a solid strand, or may eventually disappear altogether. In the last case the air bladder probably gets its contained gas from its own wall. The air bladder always lies above the alimentary tract. In a few cases it is paired. It may be transversely constricted to form several divisions, or cœcal processes may be present. The internal surface of the air bladder of fishes may be spongy, a condition similar to that of the lungs of Dipnoi and Amphibia. The lungs of some of the Dipnoi show posteriorly a paired condition, although anteriorly there is only one part. The lungs of certain Amphibia (*Menobranchus* and *Proteus*) are lower in development than those of the Dipnoi in so far as their internal surface is smooth. In reptiles and in the other vertebrates the form of the lung is determined by that of the body. The lungs show a branched system of bronchi. In this respect the lungs of crocodiles and some other forms show a decided advance over those of Amphibia. The lungs of birds (see BIRD) are in connection with large sacs, the air sacs. These air sacs fill the interstices in the body cavity, pass between the muscles, under the skin, and even into the hollow bones.

In man the lungs of the two sides are not symmetrical; the right lung has three lobes, the left two. They are connected with the exterior by the air passages composed of the bronchial tubes, trachea, larynx, and windpipe. This system of organs arises on the ventral side of the œsophagus as a duct, and constricts off to form a distinct tube. The separation begins anteriorly. The lungs arise as lateral buds at the posterior end of the furrow. Cartilaginous supports first arise in Urodeles. Definite tracheæ appear in Sirenia, Amphiuma, and Gymnophiona. The cartilaginous bands take on the form of half rings first in the Gymnophiona. A differentiated larynx appears in the Anura, is regulated by muscles, and has vocal cords. The larynx of reptiles makes no advance over that of Anura, but in crocodiles and turtles the larynx is embedded in a depression of the hyoid. The thyroid cartilage of mammals is supposed to have been derived from a part of the hyoid. In birds two larynges are present, the lower of which, the syrinx, is the functional voice organ and is restricted to birds alone.

Consult: Arnold Lang, *Text-Book of Comparative Anatomy*, translated by H. M. and Matilda Bernard (2 vols., New York, 1891–96); R. E. E. Wiedersheim, *Comparative Anatomy of Vertebrates*, English translations by W. N. Parker (3d ed., ib., 1907); Parker and Haswell, *Text-Book of Zoölogy* (2 vols., ib., 1910); T. B. Futcher, *Outlines of Physical Diagnosis of the Circulatory and Respiratory Systems* (Baltimore, 1915).

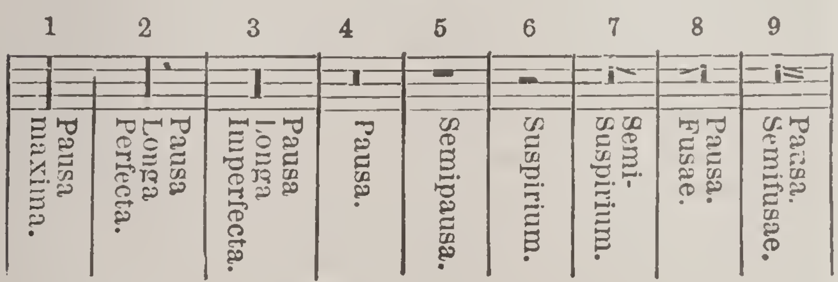
RESPOND′ENT (from Lat. *respondere*, to answer, from *re-*, back again, anew + *spondere*, to promise). In legal procedure, a party who is called upon to answer in proceedings against him in certain courts. A person who is sued in an admiralty court or in a court of chancery or equity is known as the respondent. In this sense the term corresponds to the term "defendant" in suits at common law. The term is also applied to one who opposes an appeal, and in that sense it is the opposite of appellant. In the English divorce courts the defendant is known as the respondent. See APPEAL.

RE′SPONDEN′TIA (Neo-Lat., from Lat. *respondere*, to answer). In maritime law, a loan of money on the whole or a part with maritime interest when the cargo is safely delivered at the port to which it is consigned. A respondentia bond is commonly given as evidence of the contract. The lender of the money assumes the risk that the goods may be lost at sea, and if such casualty occurs he loses the amount he has advanced. If there is a partial loss the lender is entitled to have the goods which are saved sold for his benefit. The loan is practically only on the personal security of the borrower, as the goods may be sold by the latter free from any lien at any time during the voyage or upon their arrival. The advantage which accrues to the lender in consideration of the unusual risk he assumes is that he may contract for practically any rate of interest which the borrower is willing to pay. See Bottomry Bond; Usury. Consult the authorities referred to under Admiralty Law.

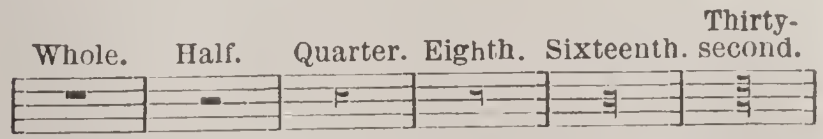
RESPONSE IN PLANTS. Plants are popularly thought of as more or less inert organisms. On the contrary, they respond to a great variety of stimuli (see Stimulus) by a change in growth rate (see Growth in Plants), a change in size, or some appropriate movement (q.v.).

RESSEL, rĕs′sel, Joseph (1793–1857). An Austrian inventor, born at Chrudim, Bohemia, and educated at Vienna and at Mariabrunn. In the latter place he studied forestry, and from 1817 until his death he held various posts in the Austrian Department of Forestry, being stationed for some time at Triest. Ressel was an able mechanic and invented several machines. His claims to the discovery of the screw propeller, which he did not patent, owing to an unfortunate accident at the trial trip of the screw steamboat, rival those of Sauvage, Ericsson, Smith, and Wilson. Consult Reitlinger, *Joseph Ressel* (Vienna, 1863).

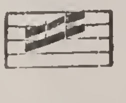
REST (AS. *rest, ræst,* Goth., OHG. *rasta,* Ger. *Rast,* rest: ultimately connected with Skt. *ram,* to rest, to rejoice). In music, an interval of silence occurring in the course of a movement between one sound and another. With the use of mensurable music (q.v.) rests began to be represented by fixed signs, and the following values were one after another decided on:



Ultimately the tails of the shorter notes were reversed and thus the following principal rest characters came into use:



For rests of a number of bars it is now usual to draw one or two oblique lines across the staff and write on them in figures the number of measures during which the voice or instrument is to be silent; thus in common time, denotes a rest of five whole notes. A rest, like a note, may be prolonged by one or more dots.



REST CURE. A system of treatment inaugurated about 1870, after the recognition of the success of Prof. Samuel Jackson, by Dr. S. Weir Mitchell (q.v.), of Philadelphia. It is calculated "to renew the vitality of feeble people by a combination of entire rest and excessive feeding made possible by passive exercise obtained through the steady use of massage and electricity." The cases most benefited by such treatment are those of women who are nervous, thin, and anæmic, partial or entire invalids. Seclusion from relatives and friends; absolute rest in bed for six weeks or more; neither reading, writing, nor sewing, and often not raising the hand or turning over in bed without aid; massage of the entire body except the face every day for six weeks; the use of the induction current with slow interruptions over the whole of the body except the face and neck during 40 to 60 minutes each day; together with large quantities of milk, cocoa, and malt extract, combine to make up the treatment. While rest cure is especially suitable to the thin, it also benefits cases of fat anæmia and the large majority of neurasthenics. It has also been of great value in indigestion and alcoholism and some early cases of tuberculosis. Rest cure is employed in modified form by many physicians. Consult S. W. Mitchell, *Fat and Blood* (new ed., Philadelphia, 1905), and F. X. Dercum, "The Rest Cure," in *Modern Treatment,* edited by H. A. Hare (ib., 1910).

REST-HARROW. A popular name for several species of European herbs and subshrubs of the family Leguminosæ. Common rest-harrow (*Ononis arvensis*) is sometimes abundant in neglected pastures, but is easily controlled by cultivation. The roots of *Ononis spinosa* are medicinal.

RESTIF DE LA BRETONNE, rĕs′tēf′ de lȧ bre-tōn′, Nicolas Edmé (1734–1806). A French novelist, nicknamed by Grimm the Gutter Rousseau, born in Sacy. The discovery of his love letters to another woman than his wife in 1765 led to the first recognition of his literary talent. From the first his fiction was the work of observation and largely of personal experience. Its success was gradual, but steady. *Le pied de Fanchette* (1769) made him known, *Le paysan perverti* (1775) made him famous and sought by distinguished men. Of other writings *Monsieur Nicolas* and the 42 volumes of *Les contemporaines* (1780–85) are noteworthy.

RESTIGOUCHE, rĕs′tē-gōōsh′. A river, 200 miles long, composed of five branches (like the hand, whence its name), forming for about 50 miles the boundary between the provinces of New Brunswick and Quebec, Canada (Map: New Brunswick, C 1). It empties into Chaleurs Bay, an arm of the Gulf of St. Lawrence. The last 18 miles it is navigable for large ships.

RES′TITU′TION (Lat. *restitutio,* from *restituere,* to restore, from *re-,* back again, anew + *statuere,* to place, from *stare,* to stand). In law, return to the rightful owner of property which has been unlawfully detained by another. The term is applied alike to cases where the property has merely been converted to the use of some one under a claim of title and where it has been stolen. In the United States, where there is doubt as to the identity or right to possession of the property, the issue should be decided by a replevin action. (See Execution; Replevin.) The term is also applied to the restoration of a part of a cargo which has been lost by jettison. See Maritime Law.

RES′TORA′TION (Lat. *restauratio*, from *restaurare*, to restore, from *re-*, back again, anew + **staurus*, Gk. σταυρός, firmly fixed stake; connected with *stare*, to stand, Skt. *sthāvara*, fixed, *sthā*, to stand). A term employed in the history of England and France in connection with the reëstablishment of monarchical government. In England it is applied to the accession of Charles II. In France the term is applied to the accession of Louis XVIII in 1814, after the abdication of Napoleon (First Restoration), and after the Hundred Days in 1815 (Second Restoration).

RES′TORA′TIONISTS. A sect which, under a new name, has revived a very ancient doctrine, which has found advocates at all times since the days of Origen (q.v.). One of the most remarkable doctrines of that father was his belief of a general *apokatastasis*, or restoration of all things, in which, after a purgation proportioned to the various moral conditions of their souls at the time of death, all men, however wicked, and all the evil angels, even Lucifer himself, would be restored to the favor of God and reunited to Him in heaven. This doctrine was condemned at the time and has since been repeatedly rejected by the churches of the East as well as of the West, though occasionally appearing, as in Tauler and some of the other mystics. The doctrine has been renewed in more than one form since the Reformation and forms the special basis of Universalism (q.v.). The particular title of Restorationists was given in the United States to the followers of the Rev. Hosea Ballou (q.v.), who, in addition to the tenet above explained, held that all retribution is confined to this life and taught that at the resurrection all men will be admitted to everlasting happiness. (See UNIVERSALISM.) Within the last century emphasis on the fatherhood of God has caused the doctrine to appear in various churches, as at least a possible view. Consult: F. W. Farrar, *Eternal Hope* (London, 1878); *Progressive Orthodoxy*, by Professors of Andover Seminary (Boston, 1886); E. H. Plumtre, *The Spirits in Prison* (London, 1886); G. A. Gordon, *Immortality and the New Theodicy* (Boston, 1896).

RESTORATION OF BUILDINGS. The movement for the care, repair, and preservation of ancient buildings as historic monuments, which began somewhat before the middle of the nineteenth century, has raised many perplexing questions as to the extent of the permissible alterations of their present condition. "Restore the building to its original aspect when first completed" represents one extreme answer to these questions, but this must usually mean a complete reconstruction, destructive of all historic interest. Moreover, how often can the "original aspect" be determined? At the other extreme is the theory of the least possible alteration of present condition, with only such repairs as are essential to preserve it from ruin. In the case of buildings added to or remodeled at different periods, in different styles, the difficulty of distinguishing between excrescences to be removed and historic additions to be retained is very great, and the question of style for the rebuilding of ruinous parts of such buildings is a further complication. These questions have been variously answered in the restoration of nearly all the cathedrals, great churches, and castles of Europe by such restorers as Sir G. Gilbert Scott (q.v.) in England, E. E. Viollet-le-Duc (q.v.) and M. Selmersheim in France, and others in Germany.

RESTORATION OF PAINTINGS. To restore a painting to its original condition is a delicate operation, requiring great knowledge and skill. By the operation of ignorant restorers of the past many of the most important paintings have been destroyed; indeed, it is a question whether restorers have not inflicted more damage than time itself. In former times the process was chiefly one of repainting, and it was then that the chief damage was done, even though the artist himself was often a man of ability. One of the most difficult tasks of the modern restorer is to remove these outer coatings of paint.

The first step in the process of restoration is to clean the picture. The usual process is to dissolve the varnish by means of brandy, weak alcohol, or some similar substance applied with the sponge, oil also being frequently applied to prevent deleterious action upon the colors. In Germany the process invented by the celebrated Bavarian chemist Max von Pettenkofer (q.v.) is often applied; this consists in subjecting the painting to cold fumes of alcohol. Unvarnished paintings are in like manner carefully washed with brandy, vinegar, or some similar substance.

The transferring of a painting from a damaged canvas, panel, or wall is effected by gluing it to a paper plaque fastened on gauze. The canvas or wood is then carefully removed and the painting is glued to a new canvas, after which the paper is removed from the surface of the painting. In case of a fresco the paper is rolled upon a cylinder while the plaster is being removed with a chisel. The retouching of the parts of the painting damaged during the restoration is an important process, which should be intrusted to most skillful hands. Consult Secco-Suardo, *Il restauratore dei depinti* (Milan, 1894), and M. L. Holyoake, in *Magazine of Art* (London, 1900).

RESTRAINT OF TRADE, CONTRACTS IN. It has always been regarded as contrary to the policy of the common law that one should be deprived or should be permitted to deprive himself of the right to engage in business or trade, and all contracts entered into for that purpose have with certain limitations been regarded as illegal and consequently null and void. Thus, a contract that one would never engage in his business or trade within 10 miles of London was deemed valid and enforceable, but a contract not to engage in any particular trade or business in England for five years was considered illegal as against public policy. The later tendency of the courts is to test the validity of the contract by its reasonableness in view of all the circumstances of the case irrespective of any arbitrary rule as to time and space. The early decisions of the United States followed the early rule of the English courts. Later decisions recognize that the United States constitute practically one country for purposes of trade, and consequently do not hold contracts in restraint of trade invalid when the restraint extends over an entire State or, indeed, over nearly all of the United States. Contracts for the purpose of creating so-called corners in the market of any commodity of general or necessary use have always been held void as unlawfully restraining trade, and contracts unreasonably in restraint of commerce are deemed void on the same principle. See Trusts.

Congress, acting under the constitutional power to regulate commerce, passed an act in 1887, known as the Sherman Act (26 U. S. Statutes at Large, 209), declaring that all contracts and combinations in restraint of interstate or international commerce are illegal and void. In construing this statute the United States Supreme Court has held that all contracts directly restraining commerce, interstate or international, whether such restraint be reasonable or unreasonable, are illegal, thus changing the common-law rule that the restraint must be unreasonable in order to invalidate the contract. In later decisions, however (the Standard Oil and Tobacco Trust Cases), the court has intimated that it should be governed by "the rule of reason," in effect reinstating the common-law rule. See Combination; Commerce; Conspiracy; Interstate Commerce; Monopoly; Strike; Trusts.

Consult J. B. Matthews, *Law of Covenants in Restraint of Trade* (London, 1893); Albert Stickney, *State Control of Trade and Commerce* (New York, 1897); A. J. Eddy, *Law of Combinations* (Chicago, 1901); John Lawson, *Monopoly and Trade Restraint Cases* (2 vols., ib., 1908); W. A. Jolly, *Contracts in Restraint of Trade* (3d ed., London, 1914).

RESTREPO, rȧ-strā'pō̇, Carlos E. (1868–). A Colombian lawyer and politician, born in Medellín. He was educated in literature, philosophy, and law in his native city and later distinguished himself in the practice of his profession. Early active in politics, he was elected to the national House of Representatives, of which body he served as President. In 1910 he was chosen President of the Republic; his administration was marked by peace and prosperity. Although decidedly anti-American at first, he later changed his attitude and endeavored to secure an adjustment of the disputes between the United States and Colombia.

RESTREPO, José Manuel (1780–1864). A Colombian historian and politician, born in Envigado. He joined the revolutionary movement in 1810 and was active in the cause of independence. He took an important part in the Congress of Cúcuta (1819) and became Secretary of Foreign Relations under the government established by the Congress. Later he served as secretary to Bolívar. He wrote *Historia de la revolución de la república de Colombia* (1827), a valuable work for the period of the revolution because of the author's part in many of the events described.

RESTRIC'TIVE COVENANTS. Covenants in conveyances which bind the purchaser and his successors in title to use the land conveyed thereby in some particular way or which prohibit them from making use of it for certain designated purposes. Common examples of such covenants are the restrictive clauses in deeds prohibiting purchasers from building beyond a fixed house line on the land, i.e., within a certain distance from the street, or prescribing the character of the buildings which they shall be permitted to erect thereon. Restrictive covenants create equitable easements in favor of the owner of the land for the benefit of which they are made, and "run with the land," i.e., continue to operate in favor of all subsequent owners of that land who buy with notice of the restriction. It is by restrictive covenants that the improvements on real estate in suburban towns are fixed. Consult H. C. Jones, *The Law of Easements* (New York, 1898), and Emory Washburn, *American Law of Real Property* (6th ed., 3 vols., Chicago, 1902). See Covenant; Equitable Easement.

REST STICK. See Mahlstick.

RES'URREC'TION (Lat. *resurrectio*, from *resurgere*, to rise again, from *re-*, back again, anew + *surgere, surrigere, subrigere*, to rise, from *sub*, under + *regere*, to direct, rule). The restoration of man after death to the full possession of his powers and faculties. In one form or another this conception is found among Mazdayasnians, Jews, Christians, and Mohammedans. While the prevailing view has generally been that the dead will rise simultaneously on the last day, there are great religious teachers who have regarded the resurrection as taking place in the case of each person immediately upon death. The resurrection has been conceived of as an awakening from the sleep of death; a reanimation of the body; a restoration of the body by the coming together of the particles that constituted it at the moment of death; a creation of a new body in harmony with the perfected spiritual character; a clothing of the departed spirit with a spiritual body descending from heaven; or a development of the germ of a spiritual organism already existing within the physical body before death. Some have maintained that all men, regardless of nationality, religious belief, or character, will be raised from the dead, while others have held that only members of a particular nation, the adherents of a certain form of religion, or the possessors of a good character will be deemed worthy to share in the resurrection.

Whether the idea of a resurrection originated with Zoroaster, already existed before his time in Iran, or was developed by his disciples cannot be determined with certainty. In its most concrete form it is met in the later parts of the Avesta (q.v.) and in the Bundahish. Here all men are to be raised on the last day by the Saoshyant (q.v.), or Savior, and those who are living at that time are to be endowed with immortality, the bodies of the dead being brought together from the different elements in the course of 57 years. It is on the whole most probable that there existed a popular belief in a future resurrection already before the time of Zoroaster. The custom of leaving the dead in the field to be consumed by wild beasts, without building for them a house, goes back to extreme antiquity. While such a practice might seem to preclude ancestral cult and the hope for immortality, the unimpeded return of the body to the different elements of nature apparently made the worship of ancestral spirits less a matter of ceremony and, in connection with the idea of a coming destruction and renovation of the world, led the Iranian mind to expect a reconstruction of each human being from its constituent parts scattered among the elements. That this occurred at a very early period is rendered probable by the emphasis put upon the future life by such Iranian peoples as the Scythians and the Thracians, who must have left the common home at a remote epoch. We have positive evidence that this doctrine was taught in the Achæmenian period in a work of Theopompus, the historian of Philip of Macedon, used and quoted by Diogenes Laertius, Æneas of Gaza, and probably Plutarch. Herodotus and Xenophon probably also heard of it, though they emphasized only the belief in immortality on the part of the Persians.

In early Hebrew thought there is no trace of this conception. The third chapter of Genesis no doubt reflects the attitude of large circles in Israel; if man had been allowed to remain in the garden of Eden he might have continued his existence indefinitely by the magic virtue of the life-giving fruit; but as he was driven out of the garden, he returns to dust and is no more. Nevertheless the survival of ancestral worship and necromancy shows that to many minds there were exceptional personalities rising above the average lot of the shades in Sheol (q.v.), still possessing high rank, power over the living, and supernatural insight. The valley of bones in Ezek. xxxvii does not suggest, but rather precludes, familiarity with the doctrine of a resurrection. In Job xix. 25–27 the text has evidently suffered much in transmission, but the whole trend of the thought clearly shows that there can be no reference to either a life beyond or a resurrection. The possibility of such a return to life is emphatically denied in chapter xiv. The first reference in Hebrew literature to the resurrection is found in Daniel xii. 2, 3, written in 165 B.C. According to this passage some of those that sleep in the dust are to be raised. Evidently the Maccabæan martyrs and the apostates are intended. An apocalypse preserved in Isaiah xxvi declares that Yahwe's dead shall live and His dead bodies shall arise, for His dew is a dew of healing and the earth shall cast forth the dead. This may have been written in the time of John Hyrcanus. Whether all Israelites are meant is uncertain. Within the canonical Old Testament these are the only passages that show an acquaintance with the doctrine. How long before the year 165 B.C. it became known in Israel we have no means of determining. In the earliest part of the Book of Enoch, written c.108 B.C., there is an allusion to some who are neither slain on the judgment day nor raised from the place of torture (xxii. 13). The resurrection is apparently limited to righteous Israelites. This is clearly the conception in Enoch xci. 10, xcii. 3–5, written c.88 B.C.; in the Psalter of Solomon iii. 12, xiii. 11, xiv. 9, xv. 13, written between 63 and 48 B.C.; in 2 Macc. vii. 9, 14, 23, 29, 36, xii. 43, 44, written in the first century B.C.; and in the Testaments of the Twelve Patriarchs, Jude xxv, and probably originally in Benj. x. A number of apocalyptic works written apparently in the reign of Domitian seem to contemplate a universal resurrection. This is most clearly the case with 4 Ezra vii. 32; probably also with Baruch xlii. 7, l. 2, li. 1 (though in xxx the resurrection is limited to the just), and with Enoch li. In the Life of Adam and Eve the resurrection of the whole human race is clearly taught (x, xiii, xxviii, xli, xliii), the addition "all that are a holy people" in xiii being probably an interpolation; also in Sibylline Oracles ii. 214–237, written c.200 A.D. The prevailing view, however, in the Talmudic and Midrashic period was that the heathen would not rise from the dead, but that the resurrection would be only for the righteous. Whether this would include all Israelites was a mooted question, the opinion being frequently expressed that some classes would be excluded. Before the third century A.D. the resurrection is always a work of God Himself. But Rabbi Samuel taught in the name of Rabbi Jonathan that the righteous would raise the dead (*Pesachim*, 68). Later it was held by many teachers that the Messiah would raise the dead. The general opinion was that the resurrection would occur in Palestine. Even the Jews who had died outside of the Holy Land were supposed to be led through subterranean passages to Palestine, where they were to be raised (*Pesiktah rabbath* i). Many supposed that of the human body one bone would never molder into dust and that from this "almond of the spine," or *os sacrum*, the resurrection body would be formed (*Bereshith rabba* xxviii).

There probably never was a time when the belief in a resurrection was universally held in Israel. While it was championed in one form or another by the Pharisaic party, it was strongly opposed in many circles. It is not known or accepted by the authors of Ecclesiasticus, Judith, Tobit, and 1 Maccabees, and it is of course emphatically denied by Ecclesiastes. The Sadducees adhered to the old idea of Sheol and rejected the doctrine of a resurrection. The Samaritans seem to have maintained the same attitude in earlier times, though they subsequently accepted the doctrine. (See SAMARITANS.) The Essenes cherished a view concerning the nature of the soul and the future life closely resembling that of the Pythagoreans, ultimately due to Indian or Persian influences, according to which the soul has existed before birth and will exist eternally after its bondage to the body is ended. A similar view was held by Jewish Gnostics. Where Greek thought prevailed the idea of immortality (q.v.) was accepted rather than that of a resurrection. This may be seen not only in the Wisdom of Solomon iii. 1–9, iv. 7, v. 16, vi. 20; 4 Macc. xvii. 5, 18, xviii. 3; and Philo, *De Vita Mosis*, ii, 633; *De Abr.*, 385; *De Somn.*, 586; *De Migratione*, 407; but also in Palestinian works like Jubilees xxiii, xxv, and Slavonic Enoch lxv. 8, 9, 10, lxvi. 7. Even where the term was kept the idea of a resuscitation of the physical body was abandoned, as by Josephus (cf. especially *Bel. Jud.*, iii, 8, 5) for the thought of an endowment with a spiritual organism. As a result of contact with Arabic learning there was an unmistakable tendency to substitute the doctrine of a natural immortality of the soul for that of a resurrection of Israel only. Modern Judaism has been largely determined in this as in other respects by Moses Mendelssohn, whose work, *Phädon, oder über die Unsterblichkeit der Seele* (1767), made a profound impression on his age.

The attitude of Jesus on this question cannot be determined with certainty. Aside from Luke xiv. 14, which, if genuine, shows that Jesus looked forward to a recompense at the resurrection of the just, there is but one saying of his recorded in the Synoptic Gospels that has any direct relation to the subject. This is found variously reported in Matt. xxii. 23–32, Mark xii. 18–27, and Luke xx. 27–38. Jesus evidently rejects the view of the Sadducees on the ground that they do not understand the Scriptures and fail to appreciate the power of God. On the other hand, he clearly does not accept the current Pharisaic doctrine of a resurrection on the last day, since he based his argument for the fact that the dead are raised on the words of Yahwe to Moses in which he speaks of himself as the God of Abraham, Isaac, and Jacob. The point of the argument is that, according to the Scriptures, these patriarchs were addressed as living several centuries after their death, and therefore must have been raised from the dead; and the natural inference is that Jesus believed in a spiritual resurrection by which those to whom God stands in relation as their God are immediately after death raised into life to be in His presence forever. Concerning those who shall be accounted worthy to share in the resurrection, he further stated his conviction that they would neither marry nor be given in marriage, but be like the angels. His warning, "Fear ye him who is able after he has killed to slay both body and soul in Gehenna," also seems to indicate that he limited the resurrection to those who should be accounted worthy. See GEHENNA; HELL.

A new assurance of a resurrection to a blessed life beyond was given to those who became convinced that Jesus had been raised from the dead. Unless it can be proved that certain of the older Epistles ascribed to Paul are not genuine, there is positive evidence that not much more than 20 years after the death of Jesus a glorious figure appeared in a vision to Paul and was identified by him as the crucified Nazarene and that Paul had heard of similar visions seen by Peter, James, and others (1 Cor. xv. 4–8). This conviction revolutionized Paul's life and caused him to see in the resurrection of Jesus the guarantee of an eternal life and the sole reason for righteous conduct in this life. While the important passage in 1 Cor. xv. contains no intimation of an empty tomb and cannot be pressed as proving a physical resurrection or an appearance to women, the earliest Gospels, Matthew and Mark, written in the main before the end of the first century, suggest that Jesus first appeared to his disciples in Galilee and that some women had found the tomb empty, but said nothing about this because of fear. The later Gospels, Luke and John, make Jerusalem the place of the first appearance of Jesus to his disciples and strongly emphasize the physical character of the resurrection body while ascribing to it functions impossible to a physical body.

In the conflict with Gnosticism, which denied the resurrection, the Church found it necessary to give added emphasis to the resurrection of the flesh. Hence the earlier creeds, which simply affirmed a belief in a resurrection or an eternal life, were gradually changed into the formula "the resurrection of the flesh," found in the Apostles' Creed. Since the thought of a resurrection of the wicked as well as the good sporadically occurs in the New Testament (as in John v. 28, Acts xxiv. 15, Heb. vi. 2, Rev. xx. 13), the idea of an interval between a first resurrection of believers and a second resurrection of the rest of mankind developed, and was especially cherished by those who looked forward to a thousand-year period of Messianic rule. See MILLENNIUM.

Through the influence of Greek philosophy the doctrine of the natural immortality of the human soul (see IMMORTALITY) became so important a part of Christian thought that the resurrection naturally lost its vital significance, and it has practically held no place in the great systems of philosophy elaborated by Christian thinkers in modern times.

The doctrine of the resurrection was adopted by Mohammed from Jewish or Christian sources and adhered to both by Sunnites and Shiites. It was subjected to grave doubts by Moslem thinkers in the times of the Bagdad caliphate, but is to-day generally accepted. See GOSPEL.

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RESURRECTION. A sombre and powerful novel by Tolstoy (1899), treating of the problems of Russian life of to-day and arraigning especially the Russian judicial prison system.

RESURRECTION, The. In Christian art Christ is usually represented as rising from the tomb bearing the banner of the resurrection, a red cross on a white ground, with the four soldiers on guard either asleep or stricken with terror. The early Christians treated the subject symbolically or allegorically, as in the story of Jonah. During the Renaissance it was treated by Fra Angelico (San Marco, Florence), Perugino (Vatican), Filippino Lippi (Munich), Sodoma (Naples), and Annibale Carracci (Louvre), and several times by Tintoretto (Venice). Among Northern artists it was best represented by the German engravers Schoengauer and Dürer and by the painter Rembrandt (Munich).

RESURRECTION PLANT. See Rose of Jericho.

RESUS′CITA′TION (Lat. *resuscitatio*, from *resuscitare*, to raise again, revive, from *re-*, back again, anew + *suscitare*, to raise, from *sus-*, *sub-*, up, under + *citare*, to call, rouse). The revival of the apparently dead. The apparently dead to whom efforts to restore are of use are those asphyxiated by drowning, by breathing illuminating gas, or by suffocation, and those suffering from syncope or the effects of electricity. In syncope, or fainting, the head and heart should be lowered and the lower extremities elevated. Respiration may be excited by sprinkling the face with water and applying to the nostrils some pungent volatile substance such as spirits of camphor or weak ammonia. Victims of electric shock may sometimes be resuscitated by the use of artificial respiration employed in conjunction with stimulation. Heat is applied to the extremities and trunk, brandy, strychnine, or digitalis given hypodermically, and inhalations of amyl nitrate administered until the face flushes. In the case of asphyxiation from inhaling either illuminating gas or carbonic dioxide, artificial respiration should be employed together with administration of oxygen through the nostrils. Apparently drowned persons may often be resuscitated by siphoning the water out of the stomach and then using artificial respiration and keeping the body warm by means of artificial heat. See Hall, Marshall; Pulmotor; Respiration, Artificial.

RESZKE, rĕsh′ke, Edouard de (1855–). A Polish opera singer, brother of Jean de Reszke, born at Warsaw. After studying with his brother he received instruction from Ciaffei, Steller, Coletti, and Sbriglia. Originally he had studied scientific farming in Silesia and had devoted himself to the care of the family estates. It was at the suggestion of Jean, then in the first flush of his success, that he took up the study of music. He made his first public appearance in 1876 at the Italiens in Paris, and for the next quarter of a century was famous as one of the greatest dramatic bassos of his time. In the nineties he and his brother were prime favorites at the Metropolitan Opera House in New York and at Covent Garden, London.

RESZKE, Jean de (1850–). A Polish dramatic tenor, born at Warsaw, a brother of Edouard de Reszke. When but 12 years of age he was singing in the cathedral, where the quality of his voice aroused the interest of the city. Afterward he took up the profession of law and obtained his degree and license. But the attraction of music proved too strong, and he began to study for the stage under Ciaffei and Cotogni. In 1874 he made his début at Venice, as a barytone, under the name of De Reschi. He attained considerable celebrity, but his physical strength began to suffer from the wear and tear of singing parts too low for him, and acting upon the advice of Sbriglia, he retired from the stage and prepared himself in a tenor repertoire. On the completion of two years of study he made his second début, in 1879, at Madrid, this time in the tenor rôle of *Robert le Diable*. His success was instantaneous and his career a continuous artistic triumph, culminating in his unsurpassed interpretation of the great Wagner rôles. He retired from the stage in 1902, and thereafter devoted himself to teaching.

RETAINER (from Lat. *retinere*, to retain, hold back, from *re-*, back again, anew + *tenere*, to hold). The employment of an attorney, counselor, or other legal practitioner, to prosecute or defend an action, or represent a person, in his professional capacity. It is not necessary that a retainer be in writing. Upon being retained an attorney has full powers incidental to professional representation. The term is also applied to a fee paid to a legal practitioner at the time of first consultation, in order to insure his future services, and constituting only a part of his whole fee. See Attorney; Counselor.

A general retainer operates as an employment of the attorney in any matter as to which the client may request his services, for a definite or indefinite period of time, during which the attorney may not accept a retainer from any other person whose interest is adverse to that of the client.

The act of an executor, to whom the estate is in debt, in retaining in his hands a sufficient amount to satisfy his claim, is also technically known as retainer.

RETAINER. See Livery.

RETAINING WALLS. Walls built to retain earth or other incoherent substances in positions and forms which without such artificial aid they could not maintain. Most earths, if left to themselves, will not stand with vertical sides, but will fall or slide down until they assume a certain slope. The angle which this slope makes with the horizontal is called the angle of repose, and it varies according to the nature of the material, the amount of water it contains, etc. The same earth will have different angles of repose under different conditions. In the accompanying figure *E* represents a section of a mass of earth which it is desired to retain by the wall *ABDC*. If the line *BG* represent the angle of repose, then it is evident that the duty of the retaining wall is to keep in position the wedge-shaped mass of earth *ABG*. This mass

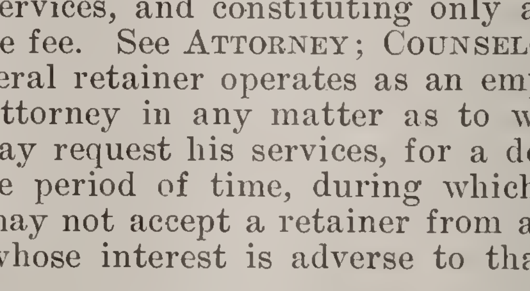

DIAGRAM OF RETAINING WALL.

tends to destroy the retaining wall, (1) by overturning it by rotation along the front edge *D;* (2) by the crushing of the stone along the front edge; and (3) by sliding the wall forward on its base, *DB*, or along some horizontal plane above the base. In designing a retaining wall the engineer seeks to fix its dimensions so that it is safe against destruction by any or all of these destructive tendencies. The difficulty of doing this arises from the fact that the pressures exerted by the wedge-shaped mass of earth vary so greatly with the character and physical condition of the material that they can only be roughly approximated. Water accumulating behind the wall may transform the earth to a semifluid state and thus enormously increase its pressure, therefore one of the chief desiderata in retaining-wall construction is to drain away this water. This is usually accomplished by having drainage holes, commonly called weep holes, through the wall at intervals. Waterproofing of the masonry is also essential.

Retaining walls are generally made trapezoidal in section, as shown by the diagram, but they are also built with rectangular sections and with concave faces. Danger from crushing seldom exists except in very high walls, and danger from shifting can be easily avoided by laying the masonry with its courses dipping slightly from the front towards the rear. As in most modern masonry work, concrete both plain and reënforced now plays an important part in the construction of retaining walls, especially in railway engineering.

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RETAL'IA'TION (from Lat. *retaliare*, to retaliate, from *re-*, back again, anew + *talis*, such). Properly, the return of like for like; usually, the infliction upon a wrongdoer of a punishment similar to or the equivalent of the evil which he has wrought. In early law, when wrongs are redressed by the act of the injured party or kinship group, such redress often takes the form of retaliation. The retaliatory idea sometimes assumes peculiar forms, as when the man whose father has been slain seeks to slay in return, not the offender himself, but the offender's father. The clearest expression of the *lex talionis*, or law of retaliation, is found in the Jewish rules, "An eye for an eye and a tooth for a tooth," and "Whoso sheddeth man's blood, by man's hand shall his blood be shed." In the Roman XII Tables *talio* is authorized as a penalty for mayhem (*membrum ruptum*) if the injured party refuses to accept pecuniary compensation. Retaliation is sanctioned in the Visigothic laws, but this (according to Brunner, who asserts that there is practically no retaliatory element in old German law) was due to the influence of the Old Testament.

When public punishment begins to take the place of private vengeance, the penalty may be, and often is, measured according to the degree of wrath which the offense commonly arouses, but purely retaliatory penalties tend to disappear. To punish a perjurer by hewing off the hand which he has raised in swearing, or a slanderer by cutting out the tongue, is not properly retaliation. Such penalties may originate in a sort of personification of the offending member, or they may be based, as Brunner suggests, on the desire to make the relation of crime and punishment obvious: "the penalty itself is to declare why it is imposed." More closely akin to retaliation is the infliction upon a false accuser of the penalty which would have been inflicted on the accused if the charge had been sustained.

In the broad sense of returning evil for evil even when there is no similarity between the offense and the punishment, retaliation includes all extralegal vengeance and all legal punishment. It is in this sense that we speak of the retaliatory theory of punishment, meaning the theory which bases the right of the community to punish criminals on the fact that they have injured the community by their crimes.

As between nations the authorities are divided as to the right of one nation to punish prisoners of war by death in retaliation for similar conduct by the other warring nation.

RETEN'TION (Lat. *retentio*, from *retinere*, to retain, hold back), or CONSERVATION. In psychology, the capacity of the organism to perpetuate the results of learning so that its present activities become significant for similar activities in the future. Retention, therefore, is the presupposition both of habit (q.v.) and of conscious memory. See MEMORY.

In Herbartian psychology (see HERBART) ideas are supposed to maintain their existence even after they have left consciousness. But most recent writers on psychology regard retention as a physical function. It is, they assert, the brain that retains. This view is based partially on the observation of pathological cases, which reveals the fact that both general and specific disturbances of memory are connected with definite changes either in the cortex as a whole or in some limited area of it. (See APHASIA.) These pathological facts have told us something of the seat of retention. Lesions in one region of the cortex affect retention of visual, lesions in another region that of auditory, ideas. There is, however, still much doubt as to the extent of the differentiation of cerebral functions. Concerning the actual physiological changes which are left over from excitation there is also some difference of opinion. Most psychologists agree, however, that the activity which a stimulus produces ceases with the passing of the stimulation or shortly thereafter. A functional modification of the exercised elements, however, appears to remain, so that their subsequent excitation is facilitated. The fact that reproduced ideas often differ widely in structural content from their perceptive originals is a further argument against mental retention. See REPRODUCTION OF IDEAS.

The conditions under which retention takes place are in general the same as those of the establishment of strong impressional and associative tendencies. Among them may be mentioned intense and durative stimulation, attention, suitable mental disposition or determination, nervous plasticity or freedom from associative inhibition, and the like. Once associative connections have been made, forgetting (the opposite of retention) quickly sets in. It is relatively great in amount during the first few minutes after learning, but after some hours proceeds very gradually. Indeed, it is doubtful if strong associative connections are ever entirely broken, provided only that subsequent disturbances (retroactive inhibitions) can be avoided.

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RETENTION OF URINE. A lack of power to evacuate the bladder. This may be either complete or partial. It should be distinguished from suppression, in which there is a failure on the part of the kidneys to secrete urine, and consequently the bladder is empty. The causes of retention may be organic or functional. Among the chief organic causes are: (1) urethral stricture, (2) injuries resulting in contraction or rupture of the urethra, (3) tumors within the urethra or pressing upon it from without, (4) foreign bodies in the urinary canal, such as small calculi, clotted blood, pieces of bougies, catheters, etc., (5) enlargement of the prostate gland, acute or chronic, especially in aged men, abscesses in the perinæum, the pressure of a loaded rectum, the head of the child during labor, or pelvic tumors of any kind. The functional causes of retention are spasm of the urethra or the neck of the bladder, partial or complete paralysis of the bladder, and hysteria.

The symptoms of retention consist of an urgent desire to pass water, with partial or entire inability to accomplish the desire; restlessness; discomfort; and pain accompanying the efforts to evacuate the bladder. If relief is not speedily afforded the bladder may rupture into the peritoneal cavity, in which case death soon follows; or the urethra behind the stricture may give way and the urine be extravasated into the surrounding tissues, provoking severe inflammation and gangrene.

Treatment will depend in its details upon the cause operative in each case. Spasmodic retention can nearly always be relieved by warm baths, heat to the perinæum, purgation, sedatives, or in extreme cases by a few whiffs of chloroform. Attempts should be made to draw off the urine through a small catheter. If this measure fails recourse must be had to aspiration of the bladder through a hollow needle thrust into it through the abdominal wall above the pubes. This measure, however, is rarely necessary. Paralysis of the bladder may arise from the general weakness of old age, from a depressed state of the nervous system in fevers of the typhoid type, in spinal disease, apoplexy, etc. Retention from paralysis is often accompanied by a dribbling away of the urine, so that it may at first be mistaken for incontinence. In chronic prostatic cases the urine has to be regularly drawn off with the catheter. See Strangury.

RETHEL, rā′tĕl, Alfred (1816–59). A German historical painter. He was born near Aix-la-Chapelle and studied under Schadow in the Düsseldorf Academy, and under Philip Veit and Schwind at Frankfort. At Düsseldorf he had earned reputation with episodes from the life of St. Boniface, one of which (1832) is in the National Gallery in Berlin, and in Frankfort he painted "Daniel in the Lions' Den" (1838, Städel Institute); "Guardian Angel of Emperor Maximilian" (fresco, ib.); "Resurrection" (church of St. Nicholas); the portraits of Emperors Maximilian I and II, Charles V, and Philip of Swabia, for the Römer (1838); "Saints Peter and John Healing the Lame" (1840–41, Leipzig Museum); and "Finding of the Body of Gustavus Adolphus" (Stuttgart Museum). In the competition for a cycle of eight frescoes from the life of Charlemagne to adorn the city hall at Aix-la-Chapelle he carried off the first prize and executed (1847–52) five of the subjects: "Otho III in the Tomb of Charlemagne"; "Destruction of the Irminsul"; "Defeat of the Saracens at Cordova"; "Conquest of Pavia in 774"; and "Baptism of Wittekind." The cartoons for these are in the National Gallery, Berlin, and the cycle was afterward completed from Rethel's designs by Josef Kehren. This monumental work, imbued with the spirit of grandeur and simplicity, was the greatest achievement of historical painting in Germany during the first half of the nineteenth century. Attacked by a nervous disease, Rethel in vain sought relief in a visit to Italy and died insane at Düsseldorf. A series of six water colors depicting the "Expedition of Hannibal Crossing the Alps" (1844–45), and his illustrations to the "Dance of Death" (1848, with poetical text by Reinick; 13th ed., 1902), also deserve mention. His brother and pupil Otto (1822–92), a pupil also of Karl Sohn and Schadow at the Düsseldorf Academy, painted at first scriptural subjects, such as "Boaz Meeting Ruth" (1855, Leipzig Museum), and afterward chiefly portraits and genre scenes. Consult Wolfgang Müller von Königswinter, *Alfred Rethel* (Leipzig, 1861), and Joseph Ponten, *A. Rethel* (Stuttgart, 1911).

RETIARIUS, rē′shĭ-ā′rĭ-ŭs. See Gladiator.

RETIMO, rā′tē̇-mọ̄. A seaport town of the island of Crete, on the north coast, 38 miles west of Candia (Map: Greece, F 8). Pop., 10,000.

RET′INA. See Eye.

RET′INI′TIS (Neo-Lat., from *retina*, so called because like fine network, from Lat. *rete*, net). Inflammations of the retina are primary or secondary to inflammation of other parts of the eye. Both eyes are usually affected. Sight is impaired, the size or form of objects seems altered, the field of vision is contracted; there is a feeling of discomfort in the eyes and at times dread of light. The ophthalmoscope shows a fundus hazy from swelling, tortuous, and dilated veins, a disk with indistinct margins, sometimes hemorrhages. Recovery may be complete or partial.

Several varieties of retinitis are described: simple, resulting from overuse of the eyes; albuminuric, complicating Bright's disease; diabetic, observed in cases of diabetes mellitus; syphilitic, occurring in hereditary and acquired syphilis: hemorrhagic, characterized by localized ecchymoses and seen in purpura, nephritis, atheroma of the arteries, pernicious anæmia, etc.; leukæmic, marked by white and yellow spots on the retina; and retinitis pigmentosa, a slow, progressive pigmentary degeneration occurring in the descendants of consanguineous marriages. The treatment of these various forms of retinitis is that of the disease with which they coexist. The retina may become detached as a result of disease, violence, or shock, constituting a serious condition. Consult J. E. Weeks, *Diseases of the Eye* (New York, 1914).

RET′INOS′PORA. A tree. See CYPRESS.

RETIRE′MENT (from *retire*, from OF., Fr. *retirer*, to draw back, from *re-*, back + *tirer*, to draw, from ML. *tirare*, to draw). In the United States army both officers and enlisted men may be retired, i.e., removed from active service and placed on the retired list as pensioners of the government for past faithful services or for disabilities contracted in the line of duty.

Officers *may* be retired on their own application after 30 years' service, *must* be retired on their own application after 40 years' service, and, under a statutory provision, are compulsorily retired at the age of 64 in the army, 62 in the navy. All such officers receive three-fourths of the active pay of the grade at the date of retirement. Officers may also be retired at any age under the provisions of Sec. 1245, Revised Statutes, which reads as follows: "When any officer has become incapable of performing the duties of his office, he shall be either retired from active service, or wholly retired from the service, by the President, as hereinafter provided." The cases of such officers are considered by army retiring boards appointed by the Secretary of War, under the direction of the President, who approves or disapproves the findings of the board. If *retired*, the officer becomes a pensioner of the government; if *wholly retired*, he ceases to be an officer and reverts to the status of a private citizen, receiving, however, one year's pay and allowances when separated from the army.

Under the Act of Congress dated Oct. 1, 1890, providing for examination for promotion, an officer below the grade of major who passes the physical but fails on his second mental examination for promotion to the next higher grade must be honorably discharged, with one year's pay, from the army. If he fails on the physical examination, through disability in line of duty, such officer passes to the retired list.

When an enlisted man of the army shall have served as such for 30 years, either in the army, navy, or marine corps, or in all, he may apply for retirement. His pay is three-fourths of the monthly pay allowed by law for the grade held when retired. In addition he receives $9.50 per month for clothing and rations, and $6.25 per month for quarters, fuel, and light.

With their consent retired army or navy officers may be temporarily assigned to certain kinds of active duty, e.g., as instructors of militia at military colleges, as recruiting officers, on staff duty not involving service with troops, etc., usually accompanied by an increase of pay. Retired officers wear the uniform of their rank, but without regimental or corps insignia. The number of retired officers and enlisted men in the army varies from time to time. In 1915 the number was, commissioned officers 1019, enlisted men 3911. Similar regulations govern the United States navy.

The laws and regulations governing retirement and the status of retired officers and men in the British army and navy are more complicated than those in the United States. In the British army a distinction is made between retired officers and half-pay officers. The latter may be recalled to active service at any time, but a retired officer is ineligible for such service except in case of war. In the United States army the age of compulsory retirement is 64 for all grades. In the British army the age varies with the grade, being 45 for lieutenants and captains, 50 for majors, 55 for lieutenant colonels, 57 for colonels, 62 for major generals, 67 for lieutenant generals. Moreover, officers of all grades may voluntarily retire after a certain specified number of years in a certain grade, receiving upon retirement either a temporary pension or a permanent pension proportional to the number of years' service. Regulations similar to the British exist in almost all armies except the United States.

Pensions for the retired officers and men of the British navy and marine are not authorized by statutory law, but are paid out of several different funds, both national and private, under the provisions of an old order in council. Provision is also made for the widows and children of officers.

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RETOR′SION (ML. *retorsio, retortio*, a bending or twisting back, from Lat. *retorquere*, to bend or twist back, from *re-*, back again, anew + *torquere*, to twist). A term of international law signifying an act of retaliation by one nation against another. Unlike reprisal (q.v.), it is not a sufficient justification for war, but is rather a political measure intended to compel one nation to accord equality of treatment to the subjects of the other residing within its jurisdiction. Thus, where one nation imposes restrictions upon aliens residing within its territory, as by unequal taxes or by differential import duties, or fails to observe the rules of international comity, as by refusing to grant the accustomed privileges to ambassadors and other diplomatic agents, the aggrieved nation is justified in applying the same kind of treatment to the offending nation or its subjects. See INTERNATIONAL LAW, *Measures Short of War.*

RETREAT′ (OF. *retrete, retraicte*, Fr. *retraite*, from ML. *retracta*, retreat, from Lat. *retrahere*, to draw back, from *re-*, back again, anew + *trahere*, to draw). In military tactics and strategy, a retirement before, or in the face of, an enemy. It is one of the most difficult as well as critical manœuvres of modern warfare. The rear guard (q.v.) is charged with the important duty of covering the retreat. Arrangements for a retreat are communicated confidentially to only a few senior commanders. In barrack, army post, or camp life and routine in the United States army, the bugle call "retreat" signifies the final assemblage of the men for the day and includes a roll call. In garrison retreat will be not later than sunset. It is played by the field music. (See BUGLE AND TRUMPET CALLS.) Extra duty details, guards, etc., are paraded and go on duty after retreat. The ceremony of the retreat is observed throughout the armies of the world and is usually accompanied by gun fire, the sounding "to the color" by the field music or the playing of the national air when lowering the national color, which is hoisted again at reveille (q.v.).

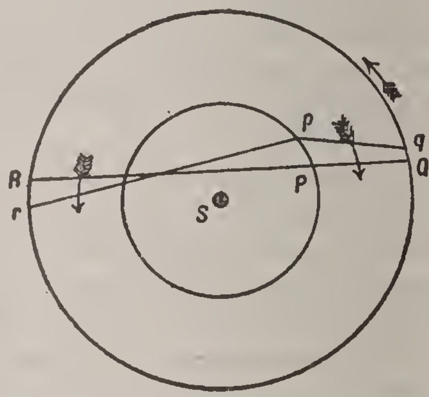
RETREAT. A term used in the Roman Catholic and Anglican churches to designate a time of temporary retirement from active life for the sake of prayer, meditation, and spiritual exercises. The practice is very ancient in the Church, as a following of the practice of Christ himself. The stricter retreats, especially those which the clergy of most Roman Catholic dioceses make every year, involve the giving up of the whole time to spiritual exercises, and usually silence is observed during them; but in the case of those who cannot leave their employment services in the early morning and evening are provided; in their case the order of observances does not materially differ from that of a mission (q.v.).

RETRENCH′MENT (from *retrench,* from OF. *retrencher, retrancher,* Fr. *retrancher,* to cut off, from *re-,* back + *trancher,* to cut, from Lat. *truncare,* to lop, from *truncus,* maimed). A defensive work in military fortification. Its profile resembled that of the redoubt (q.v.) in construction, and it was usually built across the gorge of a redan or bastion, or from shoulder to shoulder, when it was apprehended that the salient angle might fall into the hands of the enemy. Since the increase in recent years in the power of artillery and the growth of armies in many cases to sizes too large for the old-style fortifications, refinements of this type are less important. See FORTIFICATION; REDAN; REDOUBT.

RETRIEV′ER. A dog used in hunting aquatic birds. See FIELD DOG.

RE′TROAC′TIVE (from Lat. *retroactus,* p.p. of *retroagere,* to turn back, from *retro-,* back + *agere,* to do, act, drive), or RETROSPECTIVE, LAWS. These terms are used interchangeably to denote statutes which apply to a state of facts which existed before their enactment. Retroactive laws that are of a criminal or penal nature are specifically known as ex-post-facto laws, and are expressly forbidden by the United States Constitution. The Constitution also prohibits the enactment by the States of laws impairing the obligations of contracts. With these exceptions statutes are not invalid merely on the ground that they are retrospective. Although retroactive laws are in disfavor, there are many which are necessary to remedy defects in the law theretofore existing. See EX POST FACTO; INTERPRETATION; LAW; STATUTE.

RET′ROGRADE (OF. *retrograde,* Fr. *rétrograde,* from Lat. *retrogradi,* to go backward, from *retro-,* back + *gradi,* to walk). A term applied to the motion of the planets among the fixed stars when they appear to move in the *reverse* order of the signs of the zodiac (q.v.). All the planets move in the same direction round the sun, and therefore apparent retrograde motions must be due to their motion *relative* to the earth. In the case of comets, however, we have instances of motion about the sun in the opposite direction to that of the planets, and in such orbits the motion (referred now to the sun, not to the earth) is said to be retrograde. In the case of the planets let *S* be the sun, and let the two circles represent the orbits of two planets. First, let the planets be, at *P* and *Q,* towards the same side of the sun. The planet nearer the sun has of course the greater velocity, and therefore, if *p* and *q* represent their positions after the lapse of a given time, *Pp* is greater than *Qq,* and therefore the *direction* of the line *pq* (in which one is seen from the other) has rotated in the *opposite* direction to that in which either planet revolves about the sun. Hence, when a superior planet is in opposition (i.e., if *Q* be Jupiter and *P* the earth), it *appears* to move backward among the stars. When an inferior planet is between the earth and sun (i.e., if *Q* be the earth and *P* Venus), it *appears* to move backward also. If the planets be on opposite sides of the sun, as at *P* and *R* in the figure, let *p* and *r* be their positions after a given time; then *pr* has turned from the direction *PR* in the direction in which the planets revolve about the sun. Hence any planet, superior or inferior, appears to move *directly* when the sun is between it and the earth. Between these two opposite cases there must of course be points at which the apparent motion is neither retrograde nor direct; then the planet is said to be *stationary.* This case occurs whenever for an instant the lines *PQ* and *pq* are parallel, i.e., when the two planets are moving with equal velocities transverse to the line joining them, these velocities being parallel and towards the same side of the joining line.



RETURNING BOARDS. In the United States, official bodies designated by law for canvassing the results of popular elections. The general rule is that a returning board in canvassing the returns sent to it acts in a ministerial capacity and must leave the correction of error or fraud to the courts unless the return be void on its face, in which case of course the returning board must reject it. The board for canvassing the returns of State elections usually consists of certain designated State officers, including the Secretary of State and the Attorney-General. In some States the returns are canvassed by the presiding officers of the Legislature in the presence of the two Houses. In the case of members of the Legislature the returns are usually sent to the Secretary of State, though sometimes to a returning board, but all contests are decided by the Houses themselves in pursuance of a constitutional privilege everywhere allowed. In the case of local officers contested returns are settled by the courts acting as a canvassing authority or in a *quo warranto* proceeding. In the case of presidential electors Congress provided by the Act of 1887 that disputed returns in any State might be settled by such organs and according to such procedure as State law might provide. If this be not done within six days of the meeting of the electors, the two Houses of Congress have the final determination of the election.

RETZ, rĕts, Gilles de Laval, Seigneur de. See Bluebeard.

RETZ, rĕs, Jean François Paul de Gondi, Cardinal de (1614–79). A French politician and author, born at Montmirail. His early education was intrusted to St. Vincent de Paul, and he later attended the Jesuit College at Clermont. It is said that he was compelled by his family to enter the Church in the expectation that he would become Archbishop of Paris, a position which had been held by two members of his house. He was brilliant in his studies, but dissolute in private life. In 1643 he was made coadjutor of the Archbishop of Paris by Louis XIII. He devoted himself to his duties with zeal and won popularity by his profuse distribution of alms. At the time of the Fronde (q.v.) he was at first of great assistance to the royal cause, but soon aroused the distrust of the court and became the leader of the popular party, displaying consummate talents for intrigue. In 1651 he became reconciled with the Queen mother, Anne of Austria, and with her aid he succeeded in obtaining a cardinal's hat. After the return of the court to Paris, in 1652, a mission to Rome was offered to Gondi, which he seemed disinclined to accept. Mazarin was determined that his rival should be silenced, however, and managed to have Cardinal de Retz arrested and imprisoned at Vincennes. The Cardinal thereupon resigned the archbishopric of Paris, which had come to him by the death of his uncle, and was allowed to retire to Nantes, whence he made his escape to Spain (1654) and repaired to Rome. There, in spite of his previous renunciation, he again claimed the archbishopric of Paris, and in 1662 he succeeded in bartering it for profitable benefices. At the same time he became reconciled to Louis XIV and returned to France. He sold his estates, paid his heavy debts, and devoted his life to charity and religion. His *Œuvres*, which cover the years 1643–55, are described by Voltaire as displaying the grandeur, impetuosity, and inequality of genius. They are not, however, trustworthy on account of political bias. His *Memoirs* were published in English in 1904. The best edition of his works is that by Feillet in the *Collection des grands écrivains de la France* (Paris, 1870–96). Consult R. Chantelauze, *Le cardinal de Retz, et l'affaire du chapeau* (2 vols., Paris, 1878), and id., *Le cardinal de Retz et ses missions diplomatiques à Rome* (ib., 1879).

RETZIUS, rĕt′sĭ-ụs, Anders Adolf (1796–1860). A Swedish anatomist and anthropologist, father of Magnus Gustaf Retzius. He was born at Lund. He received his education in Copenhagen, Lund, and Stockholm (M.D., 1819), held several governmental offices, and became, in 1824, professor of anatomy at the Caroline Institute in Stockholm. He is well known through his anthropological researches, his works on this subject including *Formen of nordboernes kranier* (1843; translated into several languages), in which he tried to classify the human races according to the formation of the skull, and the collection called *Samlade skrifter of ethnologiskt innehåll* (1864). His *Skrifter* (Collected Works) were edited by his son in 1902.

RETZIUS, Magnus Gustaf (1842–). A Swedish histologist, born in Stockholm, the son of Anders Adolf Retzius. He studied medicine at Stockholm, Upsala, and Lund (M.D., 1871) and was assistant professor at the Caroline Institute from 1877 to 1889 and then professor of anatomy for a year. He made anthropological studies in Europe, America, and Africa. Retzius served as editor of the *Aftonbladet* from 1884 to 1887. In 1911 he received the Prussian Order Pour le Mérite. Besides some 200 papers he published: *Studien in der Anatomie des Nervensystems und des Bindegewebes* (1876), with Axel Key; *Finska kranier* (*Finnish Skulls,* 1878); *Biologische Untersuchungen* (1880–81; n. s., 1890 et seq., 14 vols. up to 1915); *Gehörorgane der Wilbelthiere* (1881–84); *Das Menschenhirn* (1896); *Crania Suecica* (1900, 1902); *Antropologia Suecica* (1902), with C. M. Fürst; *Cerebra Simiarum Illustrata* (1906).

REUBENI, rĕ′ụ-bä′nē, David. A Messianic pretender of the sixteenth century. See Messiah.

REUCHLIN, roik′lĕn, Johann, known also by the Greek form of his name, Capnio (1455–1522). The first humanist of Germany and one of the earliest promoters of Hebrew studies in that country. He was born at Pforzheim in Baden, Feb. 22, 1455. He began his studies at his native place, continued them at Freiburg, and in 1473 accompanied Prince Frederick of Baden to Paris, where he made the acquaintance of Johann Wessel (q.v.), studied Greek with Gregory Typhernas, and attended the lectures of Lapierre and Gaguin. The next year he went to Basel, where he took his bachelor's degree in 1475 and his master's in 1477. He then revisited France, studied law at Orleans and Poitiers, and gave lectures in Greek and Latin. In 1481 he established himself at Tübingen as teacher of jurisprudence and literature. He entered the service of Eberhard, first Duke of Württemberg, accompanied him to Italy in 1482, and was employed in a number of public services. He visited Italy again in 1490. In 1492 the Emperor made him a count of the German Empire, and about the same time he began the study of Hebrew under Jacob Jechiel Loans, a learned Jew who was Imperial physician. In 1496, after Eberhard's death, he went to Heidelberg and made a third visit to Italy in the service of the Elector Palatine in 1498, whom he defended in a discourse delivered before the Pope and the college of cardinals. At Rome he applied himself with renewed vigor to the study of Hebrew with Obadiah Sporno and Greek with Johannes Argyropulos (q.v.). He returned to Württemberg in 1499 and in 1502 was made a member of the Swabian confederate tribunal, retaining the office till 1513. In consequence of a quarrel between Ulrich, Duke of Württemberg, and the Swabian League, he went to Ingolstadt in 1519 and taught Greek and Hebrew at the university. When the plague broke out at Ingolstadt two years later, he returned to Tübingen, but soon fell sick, and died at Liebenzell, June 30, 1522. Reuchlin is justly regarded as the father of Greek and Hebrew studies in Germany. His devotion to Hebrew was the cause of the most interesting and important incident of his life. In 1509 one Johann Pfefferkorn, a baptized Jew, called upon princes and subjects to prosecute the religion of his fathers and especially urged the Emperor to burn or confiscate all Jewish books except the Bible. The Emperor, through the Elector of Mayence, ordered Reuchlin to give his opinion. In his response of Oct. 6, 1510, Reuchlin maintained that of all Jewish literature only books written directly against Christianity should be destroyed. This attitude drew upon him the enmity of the Dominicans and particularly of the Inquisitor Jakob van Hoogstraten (q.v.). The *Epistolæ Obscurorum Virorum* (q.v.), written by Crotus Rubianus and Ulrich von Hutten, was an outcome of the contest. While there was much in Reuchlin's character and experience to draw him towards the Reformation, he never openly joined the movement and late in life declared against Luther. Melanchthon was his great-nephew. Reuchlin's works include editions and Latin translations of Greek texts: a *Vocabularius Latinus Breviloquus* (1475); a manuscript Greek grammar (not published); the *Rudimenta Linguæ Hebraicæ* (1506), which with pardonable pride he declares to be "the first attempt to execute a grammar of the Hebrew tongue" and made "without any foreign help"; *De Accentibus et Orthographia Hebræorum Libri III* (1518); an edition of the seven Penitential Psalms (1512), the first Hebrew book printed in Germany; *De Verbo Mirifico* (1494); and *De Arte Cabbalistica* (1517), works on the Cabbala; *Scenica Progymnasmata* (1497) and *Sergius* (1507), Latin satirical comedies, not without humor and literary merit; the *Augenspiegel* (1511; ed. by Mayerhoff, Berlin, 1836), a reply to a book by Pfefferkorn (the *Handspiegel*). Two of Reuchlin's Greek treatises, the *De Quatuor Idiomatibus* and *Colloquia Græca*, have been published by Horawitz under the title *Griechische Studien* (Berlin, 1884).

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REUENTHAL, Neidhart von. See Neidhart von Reuenthal.

REULEAUX, rẽ′lō′, Franz (1829–1905). A German mechanical engineer, born at Eschweiler, near Aix-la-Chapelle, where his father had machine shops. After finishing his apprenticeship in Koblenz, he worked in his father's shops, studied at Karlsruhe, Berlin, and Bonn, and for a year was head of a factory in Cologne. Then he taught in Zurich (1856–64) and in Berlin (1864–96), where after 1868 he was director of the Industrial Academy and the rector of the Technical High School, when the academy was enlarged and the name changed. Until 1884 he was also a member of the Imperial Patent Office. Reuleaux was intimately connected with German machinery exhibits at Philadelphia in 1876 and at Sydney and Melbourne (1879–81). His *Briefe aus Philadelphia* (1877) voice a sharp criticism on German methods of construction and especially on the lack of artistic design. To remedy this fault Reuleaux made a collection of kinematic models in Berlin. His works are: *Konstruktionslehre für den Maschinenbau* (with Moll, 1854–62); *Der Konstrukteur* (1860–62; 4th ed., 1904); *Theoretische Kinematik* (1875); *Kurzgefasste Geschichte der Dampfmaschine* (1891); etc.

REUMONT, rẽ′môɴ′, Alfred von (1808–87). A German historian. He was born at Aix-la-Chapelle, studied at Bonn and Heidelberg, and in 1832 traveled through Greece and the Ionian Islands. In 1835 he entered the diplomatic service and subsequently was Minister Resident in Italy, principally at the papal court. His historical works include: *Ganganelli, seine Briefe und seine Zeit* (1847); *Beiträge zur italienischen Geschichte* (1853–57); *Die Jugend Katharinas de' Medici* (1854); *Die Gräfin von Albany* (1860); *Zeitgenossen* (1862); *Geschichte der Stadt Rom* (1867–70); *Lorenzo de' Medici il Magnifico* (1874); *Geschichte Toscanas* (1876–77); *Vittoria Colonna* (1881); *Charakterbilder aus der neueren Geschichte Italiens* (1886). Upon art he wrote biographies of Michelangelo (1834), Andrea del Sarto (1835), and Benvenuto Cellini (1847), and other works. Consult Hüffer in *Annalen des historischen Vereins für den Niederrhein*, part 77 (Cologne, 1904).

REUNION, Chambers of. See Louis XIV.

RÉUNION, rā̇′ụ′nyôɴ′, Ile de la, formerly called Ile de Bourbon. An island in the Indian Ocean belonging to France and situated 420 miles east of Madagascar (Map: Africa, K 7). It is nearly oval in shape with an area of 970 square miles. It is entirely of volcanic origin, the highest peak (a denuded crater) being the Piton des Neiges (10,069 feet). In the Pays Brûlé rises the only active volcano, the Piton de la Fournaise (8713 feet). The plateau composing the island is fissured on all sides by deep cañons through which numerous mountain torrents run to the sea. The villages are limited to the alluvial plains occurring at intervals along the coast. The climate is generally pleasant and healthful, but the island is occasionally visited by devastating hurricanes. The flora and fauna resemble those of Madagascar.

Over one-third of the total area is under cultivation. The principal products are sugar, rum, vanilla, coffee, cacao, and spices. In 1913 imports were valued at 24,935,000 francs; exports, 16,592,000. The imports are principally from France and French colonies; the exports, chief of which is sugar, go almost entirely to France. There are 78 miles of railway, connecting the chief port, Pointe-des-Galets, with Saint-Benoît and Saint-Pierre.

The administration of the colony is in the hands of a Governor, who is assisted by a privy council and an elective council general. The island is represented by one Senator and two Deputies in the French Parliament, and its towns are administered under the municipal code of France. The local budget for 1912 balanced at 5,071,980 francs. In addition a subvention from France of about half the local revenue is required. Pop., 1911, 173,822, of whom 159,218 were European, 8341 Indians, 2927 African, 1868 Malagasy, 884 Chinese, and 584 Arab. The capital is Saint-Denis (pop., 23,972); other important towns are Saint-Pierre (29,481), Saint-Paul (18,646), and Saint-Louis (13,346).

The discovery of the island at the beginning of the sixteenth century is usually assigned to the Portuguese navigator Mascarenhas, after whom it was named originally. It was acquired by France in 1649. From 1810 to 1815 the island was held by Great Britain.

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REUS, rā′ụs. A town of Catalonia, Spain, in the Province of Tarragona, 5 miles northwest of the town of Tarragona (Map: Spain, F 2). The principal buildings are the Gothic church of San Pedro, rebuilt in 1512–69, with a high octagonal tower, and the handsome modern Fortuny Theatre. There are also a large hospital, numerous public and private schools, an academy of fine arts, and a public library. Cotton spinning, which was introduced by English manufacturers in the latter part of the eighteenth century, and silk spinning are the principal industries. The exports are wines, fruit, grain, and confectionery. Pop., 1900, 26,220; 1910, 25,363.

REUS, COUNT OF. See PRIM, JUAN.

REUSCH, roish, FRANZ HEINRICH (1825–1900). A German Old Catholic theologian, born at Brilon, Westphalia. He studied theology at Bonn, Tübingen, and Munich, and was a friend and pupil of Döllinger (q.v.). Ordained a priest in 1849, he was appointed chaplain at Cologne. In 1854 he became a lecturer on Old Testament exegesis at Bonn, where he was made a full professor in 1861. For his part in the Old Catholic (q.v.) controversy he was excommunicated in 1872. Thereafter till 1878 he was Old Catholic pastor and vicar-general at Bonn. Reusch was editor of the *Bonner theologisches Literaturblatt* in 1866–77. His publications include: *Das Buch Tobias, übersetzt und erklärt* (1857); *Lehrbuch der Einleitung in das alte Testament* (1859; 4th ed., 1870); *Der Index der verbotenen Bücher* (2 vols., 1883–85); *Die Selbstbiographie des Kardinals Bellarmin* (1887); *Geschichte der Moralstreitigkeiten in der römisch-katholischen Kirche seit dem 16. Jahrhundert* (2 vols., 1889), the two last named with Döllinger.

REUSCH, FRIEDRICH (1843–1906). A German sculptor, born at Siegen. He studied in Berlin at the Academy and under Albert Wolff. Among his works in Berlin are the marble group of "Market Traffic" (1879) for the Belle-Alliance Bridge and the "Genius of Steam" for the Technical Academy at Charlottenburg. In Königsberg, where he was appointed professor at the academy in 1881, he modeled the statues of Albert, first Duke of Prussia (1891), and of Emperor William I (1894), both outside the royal palace, besides memorials, busts, and decorative figures and groups for other public buildings. At Siegen are the equestrian statue of William I (1892) and a bronze statue of Bismarck (1900).

REUSS, rois. Two sovereign principalities of Germany, situated between the Prussian Province of Saxony, the Kingdom of Saxony, Bavaria, and some of the Saxon duchies, and separated from each other by the outlying district of Neustadt of the Grand Duchy of Saxe-Weimar (Map: Germany, D 3). They are Reuss Elder Line, or Reuss-Greiz, and Reuss Younger Line, or Reuss-Schleiz-Gera. Reuss-Greiz covers an area of 122 square miles and is largely mountainous. Its principal manufactures are woolens and knit goods. The constitution of 1867 provides for a legislative assembly of 15 members. The capital is Greiz (pop., 1910, 23,245). The principality is represented by one member in the Bundesrat and sends one deputy to the Reichstag. Pop., 1871, 45,094; 1900, 68,396; 1910, 72,769, of whom 96.9 per cent evangelical.

Reuss-Schleiz-Gera consists of a number of detached parcels of territory with a total area of 319 square miles. It is a mountainous country with deposits of marble and salt. The chief manufactures are woolen and cotton goods, machinery, musical instruments, and leather. The constitution rests on the laws of 1852, 1856, and 1913. The legislative body consists of 21 members, the head of the house of Reuss-Köstritz being an hereditary member. The executive and in part the legislative powers are vested in the Prince, who is assisted by a cabinet of three members. The capital is Gera (pop., 1910, 49,276). The principality sends one member to the Bundesrat and one deputy to the Reichstag. Pop., 1871, 89,032; 1900, 139,210; 1910, 152,752, of whom 96.4 per cent evangelical. Consult Richard Mauke, *Heimatskunde des Fürstentums Reuss* (Halle, 1877), and Julius Gaul, *Beiträge zur Landeskunde des Fürstentums Reuss* (ib., 1900).

REUSS, EDOUARD GUILLAUME EUGÈNE (1804–91). An Alsatian Protestant biblical scholar. He was born at Strassburg, July 18, 1804, was educated at the seminary of his native town, studied theology and Oriental philology at Göttingen, Halle, and Paris, and took orders in the French Protestant church. He returned to Strassburg as privatdocent in 1828, was made professor extraordinary at the university in 1834, professor in 1836, and held different positions there till 1888. He died April 15, 1891. His principal works are: *Die Geschichte der heiligen Schriften des neuen Testaments* (1842; 6th ed., 1887; Eng. trans., 1884); *Histoire de la théologie chrétienne au siècle apostolique* (1852; 3d ed., 1864; Eng. trans., 1872–74); *Histoire du canon des Saintes Ecritures* (1862; Eng. trans., 1884); *Die Geschichte der heiligen Schriften des alten Testaments* (1881; 2d ed., 1890). He was one of the editors of the great edition of Calvin's works (59 vols., 1869–1900) and published a complete French translation of the Bible with commentaries (19 vols., 1875–81). His work had great importance as leading to the positions of Graf and Wellhausen in biblical criticism. Consult his correspondence (Giessen, 1904); also the memorial address by Lobstein (Strassburg, 1891) and T. Gerold, *Edouard Reuss* (ib., 1892).

REUTER, roi′tẽr, CHRISTIAN (1665–?1712). A German author, born at Kütten, near Halle. He was a witty and gifted writer, especially effective in character delineation. In his *L'Hon-*

nête femme; oder die ehrliche Frau zu Plissine (1695) he skillfully uses Molière's fable in *Les précieuses ridicules.* By far his chief work is the novel *Schelmuffskys Reisebeschreibung* (1696), a classic of lies (reëdited by Schullerus in 1885). His other writings include *Der ehrlichen Frau Schlampampe Krankheit und Tod* (1696) and *Letztes Denk- und Ehrenmahl der Frau Schlampampe* (1697), which were republished in 1890. Consult Zarncke, *Christian Reuter, der Verfasser des Schelmuffsky, sein Leben und seine Werke* (Leipzig, 1884).

REUTER, Fritz (1810–74). A German humorist, who wrote in Low German (Plattdeutsch). He was born at Stavenhagen in Mecklenburg-Schwerin, studied law at Rostock and Jena, and was arrested in Berlin for political agitation (1833), and after four years condemned to death, but his sentence was commuted to 30 years' imprisonment. After four years' confinement in various fortresses he resumed legal studies at Heidelberg, afterward managing his father's country estate till 1850, when he became a private tutor at Treptow in Pomerania. Here he first began to write Low German sketches in prose and verse, the first volumes of which, *Läuschen un Rimels* (1853), showed such charming blending of humor and pathos in anecdotes and genre pictures as to achieve an immediate success. In 1856 Reuter moved to Neubrandenburg and gave himself wholly to writing. The best of his many volumes are *Schurr-Murr* (1861) and *Olle Kamellen* (1860–66). This latter contains the partly autobiographical *Ut mine Festungstid* and *Ut mine Stromtid* (his greatest work) and the vigorous picture of Germany in 1813, *Ut de Franzosentid,* with other work of less value. In 1863 Reuter moved to Eisenach, where he died, July 12, 1874. Reuter is one of the most realistic of the greater German prose writers. It is the realism of the Dutch genre painters, minute, good-humored, bourgeois, as artistic in pathetic as in comic scenes. Reuter's works were issued in a critical edition in seven volumes by Seelmann (Leipzig, 1905). Consult: Hermann Ebert, *Fritz Reuter, sein Leben und seine Werke* (Güstrow, 1874); Otto Glagau, *Fritz Reuter und seine Dichtungen* (2d ed., Berlin, 1875): Gustav Freytag, in *Aufsätze zur Geschichte der Litteratur und Kunst* (Leipzig, 1887); A. Römer, *Fritz Reuter in seinem Leben und Schaffen* (Berlin, 1895); K. T. Gädertz, *Aus Fritz Reuters jungen und alten Tagen* (2d ed., 3 vols., Wismar, 1897–1901); C. H. Thurber, *Fritz Reuter* (Boston, 1914).

REUTER, Gabriele (1859–). A German novelist. She was born in Alexandria, Egypt, and was educated there and in Germany. Upon the sudden death of her father in 1872 she accompanied her mother to Germany, afterward residing at Neuholdensleben, Weimar, Munich, and Berlin. She began to write in 1876, achieving some success with the rather commonplace novels, *Glück und Geld* (1888); *Episode Hopkins* (1889); *Zu spät* (1889); *Kolonistenvolk* (1891). Upon the advice of Karl Emil Franzos she left the field of the popular conventional novel and struck out along more original lines. Her first notable success, and in the estimation of some her best work, was *Aus guter Familie Leidensgeschichte eines Mädchens* (1895; 16th ed., 1906), a psychological novel of the sufferings of a finer feminine nature under the artificial limitations of modern convention. Following this came the *Novellen: Der Lebenskünstler* (1896); *Frau Bürgelin und ihre Söhne* (1899; 6th ed., 1907); *Frauenseelen* (1901); *Gunhild Kersten* (1904); *Wunderliche Liebe* (1905). Among her later novels may be mentioned *Ellen von der Weiden* (1900; 7th ed., 1912); *Liselotte von Reckling* (1903); *Der Amerikaner* (1907); *Das Tränenhaus* (1909); *Frühlingstaumel* (1912). She is also author of the monographs *Marie von Ebner-Eschenbach* (1904) and *Annette von Droste-Hülshoff* (1904). Although she made a strong and moving plea for the emancipation of women, little that she wrote has sufficient artistic strength to stand the test of time. Consult: R. M. Meyer, *Die deutsche Litteraturgeschichte des 19. Jahrhunderts* (Berlin, 1900); A. F. Krause, in *Nord und Süd* (Breslau, 1902); G. Brandes, in *Gestalten und Gedanken* (Munich, 1903); E. Brausewetter, in *Meisternovellen deutscher Frauen* (2d ed., Leipzig, 1907).

REUTER, Hermann Ferdinand (1817–89). A German Protestant theologian, born at Hildesheim. He studied in Berlin and Göttingen, in 1843 became lecturer in the University of Berlin, from 1853 to 1876 was successively professor at Breslau, Greifswald, and again at Breslau, and in 1876 was called to Göttingen. His writings in Church history show thorough and scholarly research, and his criticisms are well grounded and clearly expressed. His publications include *Geschichte Alexanders III. und der Kirche seiner Zeit* (1845–64) and *Geschichte der religiösen Aufklärung im Mittelalter* (1875–77). He founded the *Zeitschrift für Kirchengeschichte,* in which he published his *Augustinische Studien* (1876).

REUTER, Paul Julius, Baron von (1821–99). A pioneer in the business of news gathering, born at Cassel, Germany. He was connected with the electric-telegraph system from its earliest establishment in Europe, and was the first to organize a central bureau for the systematic collection and dissemination of telegraphic news. This office was opened at Aix-la-Chapelle in 1849. In 1851 he transferred his office to London. Reuter established agencies in all parts of the world to supply him with news and by using all available means of communication and serving all papers impartially, he built up a noteworthy news service. In 1865 he transferred his business to a limited liability company, of which he was manager until 1878. In the same year he obtained from the Hanoverian government a concession for the construction of a cable line between England and Germany. The title of Baron was conferred upon him by the Duke of Saxe-Coburg-Gotha in 1872. See Press Associations and Agencies.

REUTERDAHL, roi′tēr-däl, Henry (1871–). An American painter and writer on naval subjects, born at Malmö, Sweden. Upon coming to New York he began his career as an illustrator of marine subjects in the magazines. He is known especially for his writings with illustrations on naval subjects. In 1908 he published "Needs of the Navy," an article which caused government inquiry of naval conditions. Reuterdahl was attached to the *Minnesota* during the cruise of the United States fleet around South America (1907) and to the *Arkansas* on a Mediterranean cruise (1913). His observations on the 1907 cruise he incorporated in 10 paintings now in possession of the United States Naval Academy. Others are in the National

Museum at Washington. Numerous naval trophies have also been designed by him. During the Spanish-American War he was a correspondent at the front. Reuterdahl received a silver medal at the Panama-Pacific Exposition.

REUTLINGEN, roit′lĭng-en. A town in the Kingdom of Württemberg, Germany, on the Echatz, at the foot of the Swabian Alps, 20 miles south of Stuttgart (Map: Germany, C 4). The flamboyant Gothic Marien Kirche, dating from the thirteenth century, was burned in 1726, but was completely restored between 1893 and 1901. Its beautiful tower, 240 feet high, dates from 1494. There are a Gymnasium, a weaving school, a school of women's work, and a pomological institute. The town is an important centre of the yarn, woolen, cotton, and cloth industry, and has numerous tanneries. In 1240 Reutlingen became a free Imperial city. Subsequently it was a member of the Swabian League, and was annexed to Württemberg in 1803. Pop., 1900, 21,481; 1910, 29,807.

RÉVAI, rå′voi, Nicholas (1750–1807). An Hungarian poet and philologist, born at Szent Miklós (Torontál). He entered the Piarist Order when he was 17, taught in the schools of the order, and in 1802, after several years devoted entirely to literature, was appointed professor of Hungarian philology in the University of Pest. He had begun to write poetry even before joining the Piarists, and in 1778 and 1787 published volumes of elegiacs and versions from the Latin elegiasts, the Alexandrine poets, the Anacreontics, and a part of the *Iliad.* But his chief title to remembrance lies in his work in Magyar historical grammar, as contained in *Antiquitates Literaturæ Hungaricæ* (1803) and *Elaboratior Grammatica Hungarica* (1803–06).

REVAL, rĕv′ål (Russ. *Revel*). An important Baltic seaport of Russia and capital of the Government of Esthonia, situated on the Bay of Reval, an inlet of the Gulf of Finland, about 230 miles west-southwest of St. Petersburg (Map: Russia, B 3). The town consists of two parts, the upper town, or Domberg (Cathedral Hill), with the old castle, the administration buildings, and the residences of the aristocracy, and the lower town, mediæval in appearance and containing the old town hall, the house of the Schwarzhäupter (an association of merchants), dating from the time when the town was a member of the Hansa, and a guild house with a museum of Baltic antiquities. The educational institutions include three Gymnasia, a Realschule, and a technical railway school.

The manufactures are machinery and beer. The harbor of Reval is one of the most spacious in Russia and freezes but seldom. Reval ranks third among the Baltic ports of Russia. Its exports and imports in 1912, about 533,000 tons, were valued at over $52,000,000. The principal exports are spirits, grain, flax, animals, and a species of anchovy which is caught and pickled locally; the chief imports, cotton, coal, and petroleum. Reval is the seat of an admiralty and of the administration of the Baltic lighthouses. The sea baths in the vicinity are well patronized. Pop., 1910, 98,995, about one-half Esthonian and over one-fourth German. The foundation of Reval is ascribed to the Danish King Waldemar II. The town joined the Hanseatic League in 1284 and soon attained considerable commercial importance. In 1346 it passed from the overlordship of the Danes to that of the Teutonic Knights. Sweden acquired it in 1561, and Peter the Great annexed it to Russia in 1710. The construction of a naval harbor was begun in 1912. The town was bombarded by the Germans in the European War which broke out in 1914. See War in Europe.

RÊVE, råv, Le (Fr., The Dream). One of the Rougon-Macquart series of novels by Emile Zola (1888).

REVEILLE, re-vāl′yå, *or* (more usually in United States military service) rĕv′å-lē′ (OF. *reveil*, Fr. *réveil*, awakening, from OF. *resveiller*, to wake again, from *re-*, again + *esveiller*, to awake, from Lat. *ex*, out + *vigilare*, to awake, from *vigil*, wakeful, from *vigere*, to be lively; ultimately connected with Eng. *wake*). A military trumpet, bugle, or drum call sounded at break of day, or such time afterward as may be ordered, to rouse the men from sleep. Officially it is the commencement of the day's routine. The military day is from reveille to retreat (q.v.), and the night from retreat to reveille. See Bugle and Trumpet Calls.

REV′ELA′TION (Lat. *revelatio*, from *revelare*, to reveal, unveil, from *re-*, back again, anew + *velare*, to veil, from *velum*, veil, cloth, sail, from *vehere*, to carry along). In theology, a term used in both a general and a specific sense. In its broadest signification it expresses the unveiling or manifestation of the divine to the human. In the narrower sense it is applied to one form of this manifestation, viz., the written word of God in the Bible.

Using the term in the first or general sense, God manifests Himself in nature, in history, in the moral government of the world, in reason, and in the old ethnic religions and certain of the pagan philosophers. It seems impossible to believe in man and in a personal God without believing in a revelation. The aspirations of the soul demand it. Man himself, as reflecting the divine image, warrants it. Nature gains a meaning only if it is the speaking and acting of God—divine language in cipher. The universe is a manifestation of God's glory, a disclosure of His power. Specific revelation does not contradict these indications of divine truth in nature. It gives them articulate expression. History and revelation are inseparable. The march of events and the development of ideas are but parts of a moving panorama of divine creation and guidance. As men have studied the history of the human race they have found truths about God and His purpose in the world. Reason and revelation are not antagonistic. Reason grasps and discerns and even defines the supersensuous. It is part of the divine image in man, and so is naturally predisposed to the reception of the revealed. The ethnic religions were clearly media of divine revelation. They were partial disclosures of God to man—a feature in His gradual unveiling of Himself. They were preparatory to Christianity. Pagan philosophy, in the persons of some of its brightest lights, was a part of revelation. Men like Socrates, Plato, and Aristotle among the Greeks, and Cicero, Epictetus, and Marcus Aurelius among the Romans, had wonderful glimpses of truth and formulated admirable moral codes. They have been described as Christians without knowledge of the Christ. In fact natural and revealed religion are now widely viewed as parts of a great whole and not as distinct and separate manifestations of the divine. Much of the teaching of revelation, technically so called, consists in the unveiling to us of nature and of life. Revelation does not merely superadd to the achievements of human knowledge. It penetrates to the moral and spiritual meaning of the world in which we live.

Historical theology has maintained that, despite all this, the fact remains that the disclosure of the divine in revelation generally was but partial and therefore preparatory to a specific revelation. Man in his intellectuality was painfully sensible of the soul sickness of the world, but he had no cure. To break the power of sin and quicken the higher and spiritual life he needed a revelation of fatherly love. The deepest discoveries and loftiest achievements of the human intellect needed to be supplemented by a special revelation. "The world by wisdom knew not God." The specific revelation was given in the written word. It may be divided into three epochs, the primitive revelation or protevangelium, the covenant revelation to Israel, and the revelation in the appearance of Jesus Christ. The Incarnation (q.v.) is held to be the culmination of every divine manifestation, the central point of all history sacred and profane (Heb. i. 1, 2). The Old Testament represented a gradual process of education. God gave to men as they were able to receive. But the message became more and more explicit as the history of the ancient people was developed, until it culminated in Jesus Christ, in whom men saw "God manifest in the flesh" (John i. 18). The crown of the Old Testament religion was prophecy, and Jesus was the greatest of prophets.

In discussing the specific revelation of the Scriptures it should be borne in mind that revelation and inspiration are not synonymous terms. Revelation has been limited to the direct communication from God to man of (1) such knowledge as man could not attain in and of himself and (2) information which, though attainable in the ordinary way, was not, in point of fact, known to the person who received the revelation. Inspiration is explained as the actuating energy of the Divine Spirit, under whose guidance the human agents chosen by God have officially proclaimed His will either by (1) word of mouth or (2) the committal to writing of the several parts of the Bible.

Bibliography. Theodor Christlieb, *Modern Doubt and Christian Belief* (Eng. trans., 4th ed., New York, 1879); R. Flint, *Theism* (3d ed., Edinburgh, 1879–80); A. B. Bruce, *The Chief End of Revelation* (London, 1881); John Wordsworth, *The One Religion*, Bampton Lectures (2d ed., ib., 1887); Samuel Harris, *The Self-Revelation of God* (New York, 1887); the articles "God" and "The Holy Spirit and Inspiration," in *Lux Mundi: Studies in the Religion of the Incarnation*, edited by C. Gore (13th ed., London, 1890); G. P. Fisher, *The Nature and Method of Revelation* (New York, 1890); B. F. Westcott, *Introduction to the Study of the Gospels* (ib., 1896); R. F. Horton, *Revelation and the Bible* (ib., 1902); J. R. Illingworth, *Reason and Revelation* (ib., 1902); Reinhold Seeberg, *Revelation and Inspiration* (ib., 1910); W. W. Guth, *Revelation and its Record* (Boston, 1912); and the works mentioned under Inspiration.

REVELATION OF SAINT JOHN, The. The name given in the English Bible to the last book in the New Testament, the word "revelation" being the Latin equivalent of the Greek word ἀποκάλυψις, *apocalypsis* (uncovering or unveiling), the first word of the book.

I. **General Character of the Book.** The Book of Revelation belongs to a distinct class of literature, which has been called, probably after the title of this book, apocalyptic. (See Apocalyptic Literature.) Only in the light of this classification can the book be understood. An apocalypse usually seeks to explain the present dominion of evil in the world and to encourage faith in God and His rule by foretelling the approaching end of evil and the fulfillment of the prophetic hopes. The origin and reign of evil are usually assigned to the agency of fallen angels and of evil spirits generally, and the consummation hoped for is a new world age which will come by a miraculous deed of God. Man must wait for this with patient faith, and the seer's art consists chiefly in discovering the time and manner of its coming. This he does by such a fitting together of ancient prophecies and apocalyptical images with the events of his own time as shall give assurance that the longed-for end is at hand.

Turning to the Book of Revelation, there can be no doubt that it is an apocalypse in the sense just defined, and the presumption that it is to be interpreted as such is strong. Like Daniel, it was written in a time of religious persecution at the hands of the ruling kingdom of the world, and its aim was to encourage the faithful to resist the allurements and endure the violence of the world power in view of the speedy coming of judgment and deliverance. Like Daniel, also, it has the course and end of world history in view and not principally the destiny of the individual soul. Other apocalyptical features of the Book of Revelation are its constant use of the vision form with angelic interpreters; its abundance of highly wrought and fantastic imagery, derived in large part from the Old Testament and from apocalyptical traditions, though freely combined and applied to new conditions; its explanation of the present dominance of evil as due to demonic powers, whose malign rule is embodied in Imperial Rome; and its general scheme of the future, which embodies many elements drawn from Jewish apocalypses. The Christian character of the book does not involve differences great enough to justify us in separating the book from its class and applying to it different methods of interpretation. It is, then, to be assumed that the predictions of the book concern the immediate and not the distant future, as indeed the writer explicitly affirms (i. 1, 3, xxii. 10–12). We may expect to find visions or fragments from earlier writings or traditions and to be able to distinguish between their earlier setting and application and the meaning our author gives them. Furthermore, we may expect to find the value of the book to lie, not in disclosures of the course of Church history down to the present, nor in predictions of still future events, but, historically, in its fitness to meet a great crisis in the life of the early Church, and permanently in its underlying faith in God and the certain victory of His cause.

II. **Contents and Plan.** The contents of the book may be outlined as follows:

Brief introductory statement showing the source and authority of the book (i. 1–3).

A. The letters to the seven churches (i. 4–iii. 22).

1. General introduction (i. 4–20), containing (1) the signature (John) and address (i. 4a); (2) salutation from God and the heavenly spirits and Jesus (i. 4b–5a); (3) ascription of praise to Jesus (i. 5b–6); (4) announcement of his coming to judgment (i. 7–8).

2. John's vision of Jesus, who commands him to write (i. 9–20).

3. The messages to the seven churches of Asia (ii. 1–iii. 22).

B. The Apocalypse proper (iv–xxii).

1. Introductory. (1) The heavenly King on His throne (iv); (2) the seven-sealed book and the Lamb who alone can unseal it (v. 1–7); (3) the Lamb receives the book. Hymn of praise (v. 8–14).

2. The seven seals, trumpets, and plagues (vi–xviii).

(1) The seven seals broken. After the first six a pause, then the seventh introduces the next series of events (vi. 1–viii. 5).

(2) The seven trumpets and their accompanying calamities (viii. 6–xiv. 20). Again after the first six a pause (x. 1–xi. 14), then with the seventh trumpet the kingdom of Christ is announced and its great conflict with Satan is unfolded (xi. 15–xiv. 20).

(3) The seven last plagues, culminating in the great judgment on Babylon (Rome) (xv–xviii).

3. The culmination, the conquest and final punishment of the beast and his followers and the marriage of the Lamb (xix–xxii).

III. **Interpretation.** The curious history of the interpretation of this book cannot here be reviewed. It has been supposed to have been written against Mohammed and the Turks; against the Pope and the Roman Catholic church; against Luther and the Reformation; against Napoleon; etc. Many still hold that the book predicts the whole course of Church history past and to come. Almost all modern scholars, however, seek for the meaning of the book in the conditions of the writer's own time.

Imperial Rome, the persecutor of the Church and claimant of divine honors in the person of the Emperor, is the beast, the agent of Satan, which the book assails and whose fall it announces. Isolated scholars of far older times knew this, but it was especially the work of Lücke, Bleek, and Ewald that established it. With this is commonly connected the view that Nero was the wounded head (xiii. 3), the name signified by 666 (xiii. 18) and the one whose return from Hades and attack upon Rome in alliance with the Parthians is predicted in chapter xvii.

In different parts of the book different periods and different types of religious thought appear to be indicated. These facts and the composite character of some Jewish apocalypses have led to the effort to solve the problem of the book's composition by literary analysis and the theory of various dates and authors. Weizsäcker suggested in 1882 that the writer incorporated some older oracles, Jewish or Christian, such as vii. 1–8, vii. 9–17, xi. 1–13, xii, xiii, xvii. Vischer, on the other hand, proposed the view that the book is a Jewish apocalypse (iv. 1–xxii. 5, omitting obvious Christian amendments) set in a framework (i–iii, xxii. 6–21) and slightly revised by a Christian hand. This theory came out in 1886 with Harnack's indorsement and was accepted by several German critics. More elaborate analyses followed. Two Jewish apocalypses were found in the book by Weyland, and Spitta (1889) made the original book a Christian apocalypse by John Mark (60 A.D.), to which a later Christian added two Jewish apocalypses of the times of Caligula and Pompey. Against such views there has been a reaction in favor of the simpler one of Weizsäcker. The unity of the book is maintained, but the writer is believed to have made use of materials already shaped by earlier hands and in part Jewish in origin. The Jewish character of vii. 1–8 and of xi. 1–13, with its date before 70 A.D.—Jewish oracles applied in a figurative sense to Christians as the true Israel—and some of the peculiarities of xii, xiii, xvii, and other passages, may thus be explained in a way consistent with the ascription of the book to a Christian writer of Domitian's reign.

The next problem naturally is concerned with the first meaning of these incorporated materials. The most important study in this direction is that of Gunkel in reference to chapter xii (1895). His theory is that the dragon who seeks to kill the child and persecutes the mother is ultimately derived from a Babylonian account of the birth of Marduk, the sun god, destined to destroy the chaos dragon and to create the world. Many who have not accepted Gunkel's reconstruction of an otherwise unknown part of the Babylonian myth have approved in general his emphasis on tradition as a great factor in the production of an apocalypse, and many have assented in particular to his theory that a sun myth underlies chapter xii, whether Babylonian or Greek (Dieterich) or Egyptian (Bousset, with hesitation) in origin. Wellhausen has objected to the method and declared that the writer's own meaning is all we need to inquire after, and that he has shaped his figures to represent current events to a much greater degree than Gunkel allows. Bousset, one of the most important recent writers on the subject, adheres in general to Weizsäcker's idea of the composition of the book and to Gunkel's view of the significance of tradition. He put forth the hypothesis that an apocalypse of Antichrist, of Jewish origin, was current in New Testament times and on into the Middle Ages; that it was not dependent on Revelation, but that several of the fragmentary (Jewish) traditions which Revelation incorporates were derived from it (vii. 1–8, xi. 1–13, xiii. 11–17, xiv. 14–20).

Along with the recognition of the writer's dependence on or use of apocalyptical tradition, rightly emphasized by Gunkel and Bousset, it is also necessary to recognize the fact that he used Old Testament material with much freedom and often in the spirit of a poet. This is illustrated by such passages as i. 12–20, iv, xviii, xxi–xxii. 5. The author wrote as one whose mind was filled with Old Testament prophetic language; but though often quite limited to it for the expression of his thoughts, yet he used it freely and put into it the emotions of his own soul. That these were intense is a fact that must be seriously reckoned with in studying his book, whatever one may think about the question of actual ecstasy.

IV. **Historical Occasion, Purpose, and Date.** The seven letters (chapters i–iii) are the most original part of the book and contain the most specific references to concrete conditions. Though addressed to actual churches whose conditions the writer knows, they are evidently meant, taken together, to give the message of the spirit of Christ to all his churches. The seven cities are named in geographical order, moving from Ephesus north, east, and south. The worship of the Emperor had been enforced in this region for a long time. Pergamum had a temple to Augustus in 29 B.C. and remained the centre of the cult in Asia (cf. Rev. ii. 13). The Book of Revelation was written chiefly to expose the real character of this worship of a mere man and to encourage Christians to refuse to conform to it at whatever cost. This cult as it was practiced in the Province of Asia and encouraged by the provincial officials is the second beast of chapter xiii, and all who take part in it are threatened with the impending fate of Rome itself, while those who resist it even to death will receive a glorious reward. Some persecutions of Christians had already been endured (ii. 3, 13, iii. 8), but far more severe trials were at hand (ii. 10, iii. 10), for which the book would prepare the way. The glory and reward of martyrdom are vividly portrayed. An official persecution of Christianity such as is here contemplated points to a time not earlier than Domitian. The relaxation of earlier zeal, the loss of love, the adoption of heathen ways of living, which the letters condemn, indicate the same period, as does the fact that Paul's position as founder of the church at Ephesus appears to be wholly a thing of the past. It is true that xi. 1–13 dates from before 70 A.D., but it is no less certain that it was originally a Jewish oracle. Its application in a figurative sense to the safety of the true worshipers of God, i.e., Christians, in the approaching crisis shows that the literal siege and fall of Jerusalem had long ago proved the oracle to be in its literal sense—which was indeed contrary to the word of Jesus—untrue. In xvii. 10 Vespasian seems indicated, but verse 11 is probably meant to carry us over into Domitian's reign. If the Nero myth is referred to in chapter xvii, this also, in this form, belongs to the close of the century. We may therefore conclude that the book was written, as Irenæus says, "near the end of the reign of Domitian," i.e., about 93–96 A.D.

V. **The Christianity of the Book.** The relation of the book to Paulinism is an unsolved problem. The stress it lays upon the transcendence of God and upon the kingly and judicial functions of Christ, its view of salvation as a reward for overcoming the world and keeping the commands of God, are Judaistic aspects of the religion of the book. Its attitude towards Rome, also, is not that of Christ (Mark xii. 17) and of Paul (Rom. xiii. 1–7, cf. 1 Pet. ii. 13–17). Yet an anti-Pauline tendency need not be inferred. Circumstances had changed, and Rome had become the enemy of the Church and the power of lawlessness instead of the one who restrained that power (2 Thess. ii. 7) and protected rather than persecuted the Christian, so that Antichrist now inevitably took on a Roman in place of a Jewish form. Furthermore, over against the Jewish-Christian traits of the book we find a Christology not unrelated to Paul's (cf. i. 5, iii. 14, with Col. i. 18, and Rev. v. 9 et seq. with Phil. ii. 5 et seq.), an eschatology at many points in striking agreement with his, and a universality which at least is totally different from the exclusiveness of Paul's Judaistic opponents (vii. 9 et seq.). We cannot therefore with Baur regard Revelation as a simple product of the Jewish Christianity which opposed Paul. It is probably best to say that the book represents a late development of primitive Christianity, not much influenced either way by Paul.

VI. **Canonicity and Authorship.** The place of Revelation in the canon has been much disputed. It was accepted in the Western Church after Hippolytus wrote in its defense against Caius, a presbyter of Rome (c.215). For a long time the Eastern Church refused to recognize the book as canonical. Eusebius records and sympathizes with the objections of its critics. It was not in the original Syriac New Testament. The pressure of the Western Church finally secured its place in the canon. In the West only Jerome shows some sympathy with Eastern doubts. Its place in the canon was again somewhat insecure at the beginning of the Reformation; Luther in the first edition of his New Testament expressed a strong aversion to it because of its obscurity and especially because he did not find in it the Pauline gospel. Later he expressed a more favorable judgment. Zwingli did not accept it as canonical. Calvin at least did not comment upon it.

The writer calls himself John (i. 1, 4, 9, xxii. 8) and says that he saw his visions on the island of Patmos (q.v.), where he was, it would seem, in banishment. Justin Martyr is the first to identify this John with the Apostle, and from Irenæus and Tertullian onward this view was almost unquestioned. Yet Dionysius of Alexandria (c.255) argued on the basis of a comparison with the Fourth Gospel that the author of Revelation was another John; and Eusebius suggested the presbyter John, of whom Papias speaks. The earliest opponents of the canonicity of the book, the Alogi, ascribed it to the Gnostic Cerinthus, an idea adopted by Caius. The author himself does not say that he is an Apostle (see on the contrary, xxi. 14, xviii. 20), and nowhere reveals any personal knowledge of the earthly life of Jesus. It cannot quite be said that he assumes a position of personal or official authority over the seven churches. He is their brother and fellow in trial (i. 9), but the authority that speaks through him is Christ. He claims only to be a true prophet, truly to convey the message of Christ. For his book he makes great claims, but not for himself. Of the three possibilities—that it is by the Apostle; that it is a pseudonymous writing in the Apostle's name; and that it is by another John—the second can with some confidence be rejected. For though pseudonymity characterizes all Jewish apocalypses, we find here none of the familar signs of it, no references to known events in the life of John such as we should expect. If the Apostle was the recognized head of the churches of Asia centring in Ephesus during the last quarter of the first century, the expression "John to the seven churches" (i. 4) would suggest him. If that place was occupied by John the presbyter, he would be the one indicated. The most serious difficulty in the way of accepting the Apostle's authorship is the radical difference in style and in conception that separates the Apocalypse from the Gospel. Though minor points of likeness exist, the difference is so great that it seems almost impossible to ascribe them to one mind. The difficulty is greater now that it is no longer probable that they can be separated widely in date by putting Revelation before 70 A.D. The question of authorship must therefore remain open, but this question does not affect our view of the value of the book and the way in which it is to be understood.

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REVELL, rĕ-vĕl′, Fleming Hewitt (1849–). An American publisher. He was born and educated in Chicago and in 1869 entered upon independent editorial and publishing work. After 1890 he was president of the Fleming H. Revell Company, publishers, who made a specialty of religious books. Revell became also a trustee of the New York Life Insurance Company and was active in the work of the Presbyterian church and of the New York Y. M. C. A.

REVELS, Master of the. See Master of the Revels.

REVELSTOKE, rĕv′el-stōk. A city in the Kootenay district, British Columbia, Canada, on the Columbia River and on the Canadian Pacific Railway, 379 miles northeast by rail from Vancouver (Map: British Columbia, E 4). It is a divisional point on the Canadian Pacific and the seat of the county court for West Kootenay. The industrial establishments include railway repair shops, saw mills, breweries, and manufactories of sashes and doors, and cigars. Pop., 1911, 3017.

REVENTLOW, rä′vĕnt-lō, Christian Ditlev Frederik (1748–1827). A Danish statesman and reformer, educated at Sorö and Leipzig. He traveled on the Continent and in England to study economic conditions. Reventlow completely changed the status of the Danish peasantry by placing them on an equal footing with other subjects. His agricultural and educational reforms he first introduced on his estates, then throughout the nation. The ultraconservative Guldberg ministry opposed him, but with its fall (1784) and the coming of Bernstorff Reventlow had his chance. Through great administrative ability he rose to be Minister of State (1797). A commission appointed by him to investigate the condition of the peasantry resulted in the reform mentioned. Reventlow also accomplished reforms in banking, taxes, and trade, including abolition of the monopoly of the Iceland trade. In 1813 he resigned from all offices except that of Minister and retired.

REVENTLOW, Ernst, Count (1869–). A German journalist and Pan-Germanist, born at Husum. He was early in the navy, where he rose to be captain. During the European War (1914 et seq.) he wrote many truculent articles for the *Deutsche Tageszeitung*, on which he was a leading editorial writer, enthusiastically supporting the Von Tirpitz plan of submarine warfare. When the German government signified its willingness to comply with demands of the United States that the rights of American citizens on the high seas be respected, the *Tageszeitung* was suspended (1915) because it opposed such compliance. Reventlow's writings include: *Russisch-Japanische Krieg* (3 vols., 1904–06); *Deutschland in der Welt voran* (3d ed., 1906); *Die deutsche Flotte und ihre Aufgaben* (1906); *Holder Friede, süsse Eintracht* (1906); *Die englische Seemacht* (1906); *Kaiser Wilhelm II und der Byzantiner* (1906); *Weltfrieden oder Weltkrieg* (2d ed., 1907); *Gefahr in Verzug* (1907); *Der Kaiser und die Monarchisten* (1913); *Deutschland zur See* (1914); *Deutschlands auswärtige Politik, 1888–1913* (1914); *Der Vampir des Festlandes* (1915).

REVENUE, Public. See Finance; Internal-Revenue System; Taxation.

REVENUE-CUTTER SERVICE, United States. A military service, organized by Act of Congress in 1790, for the enforcement of navigation and customs laws. It was the first armed maritime force of the government, having been constituted about eight years before the United States navy. There being no naval establishment at that time, the service, as a matter of convenience, was attached to the Treasury Department, then presided over by Alexander Hamilton, where it has since remained. Its first fleet consisted of 10 small, single-masted, light-draft sailing vessels, manned with 10 masters, 30 mates, 40 mariners, and 20 boys. By degrees, and as occasion arose, the service was augmented in strength and armament, and on July 1, 1799, Congress authorized the President to "cause the revenue cutters to be employed to defend the seacoast and to repel hostility to vessels and commerce within their jurisdiction." The rapid growth of foreign trade and a shipping interest that was constantly developing at home created the necessity for more efficient means of protection, and swifter cruisers, better armed, manned and equipped, were gradually added to the force. The duties of these vessels were extended to the suppression of piracy, that had become common on account of the many adventurers attracted to American waters. A distinctive revenue ensign and pennant were provided by law. (See Colored Plate in article United States.) Beginning in 1843, steamers were introduced, and they have entirely superseded the old type of sailing cutters.

Revenue cutters have participated in all the wars of the United States except the Algerine war and have been prompt to respond to any emergency. In 1797, when France assumed a belligerent attitude, and during the troublous times that followed, the cutters aided in maintaining the dignity and position of the government. Seven of them were employed in the waters of the West Indies. The Embargo Act of 1807, intended to countervail Napoleon's decrees, put the service into special requisition in guarding the seaboard and preventing the departure of unauthorized merchant ships. In the War of 1812 its force was actively engaged in patrolling the coast and repelling foreign invasion. During the nullification troubles of 1832–33 several revenue vessels were stationed off Charleston ready to enforce the execution of the tariff laws. At the time of the Seminole War, in 1836, they transported troops and munitions and afforded protection to settlers along the coast. In the war with Mexico eight vessels shared in the naval attacks on Alvarado and Tabasco and coöperated with the naval squadron. In 1858 the steam cutter *Harriet Lane* took part in the naval expedition to Paraguay and was considered one of the most efficient ships of the fleet. During the Civil War the cutters were busily engaged conveying dispatches, pursuing blockade runners, doing guard and reconnoissance duty, and joining in attacks on the enemy's forts and batteries. Throughout the war with Spain 20 vessels of the service, carrying 71 guns, 131 officers, and 725 men, were employed with the army and navy, while 3, just constructed, with 25 officers and 210 men, were under orders to go to the front when the war closed. Eight cutters were in the North Atlantic squadron on the Cuban blockade, 4 coöperated with the navy on the Pacific coast, while one was in the battle of Manila Bay.

The affairs of the Revenue Cutter Service are administered by the captain commandant, under the direction of the Secretary of the Treasury. In the field the service is divided into five divisions, each under the supervision of a senior captain. The headquarters of these divisions are located at Boston, Mass., New York City, San Francisco, Cal., Seattle, Wash., and Unalaska, Alaska.

In 1915 there were in the service 44 vessels, 19 of them harbor and anchorage boats, steam launches, etc., and the remaining 25 steamers ranging from 400 to 1700 tons' burden. Those built of steel in recent years are admirable models of marine design and architecture and are among the fastest of their class afloat. Nearly all have been constructed under the immediate supervision of officers of the corps and devised with special reference to the general needs of the service. They are usually armed with from two to nine improved rapid-fire guns and are provided with necessary small arms for the use of the crews. In time of war their equipment may be readily augmented. The vessels are kept prepared, as far as possible, for prolonged voyages and the performance of any duty that may be legally assigned them. In this connection it may be stated that about all the early authentic information concerning the natural features of Alaska, its climate, the characteristics of the natives, and the resources of that country, were obtained by explorations made by officers of the revenue-cutter service. Several vessels make cruises each year into the Bering Sea and Arctic Ocean for the protection of the fisheries and government interests.

The active list of the service comprised, in 1915, a captain commandant, 6 senior captains, 31 captains, 37 first lieutenants, 42 second lieutenants, 42 third lieutenants, 1 engineer in chief, 6 captains of engineers, 28 first lieutenants of engineers, 22 second lieutenants of engineers, 24 third lieutenants of engineers, 2 constructors with rank of first lieutenant, and 21 cadets and cadet engineers. In addition there are about 1648 warrant officers, petty officers, and seamen. The officers of the engineer corps rank with line officers of corresponding grades. All are commissioned by the President, by and with the advice and consent of the Senate, and, under the law, rank is held as follows: captain commandant with colonels in the army and captains in the navy; senior captains with lieutenant colonels in the army and commanders in the navy; captains with majors in the army and lieutenant commanders in the navy; first lieutenants with captains in the army and lieutenants in the navy; second lieutenants with first lieutenants in the army and lieutenants (junior grade) in the navy; third lieutenants with second lieutenants in the army and ensigns in the navy. When revenue cutters serve in coöperation with the navy, pursuant to law, their officers below the rank of senior captain hold rank with and next after naval officers of the grades named. The captain commandant and officers of the rank of senior captain hold rank with naval officers of the grades named. The commissioned officers of the service receive the same pay and allowances as officers of corresponding rank in the army and are retired for physical disability or on reaching the age of 64 years. Promotions are made, in the order of seniority, to fill vacancies which may occur in the various grades, after the candidates have qualified by a professional examination.

In 1876 Congress enacted a measure permitting the Secretary of the Treasury to appoint cadets to fill vacancies occurring in the grade of third lieutenant. The object was to provide means for educating young men for deck officers. Under the operation of this system the active list of the line in 1915 was composed of cadet graduates with but one exception. Some 10 additional appointments have been made from graduates of the Naval Academy. Before the cadet system was organized candidates from the merchant marine and volunteer navy were admitted directly to the grade of third lieutenant. An applicant for a cadetship in the line must be not less than 18 nor more than 24 years of age, of vigorous constitution, physically sound and well formed, not less than 5 feet 4 inches in height, of good moral character, and unmarried. He is required to pass a satisfactory entrance examination in spelling, geography, general history and Constitution of the United States, grammar, composition and rhetoric, arithmetic, algebra, geometry, trigonometry, physics, English literature, one modern language (either French, German, or Spanish), and general information. The examination, which is open to all qualified persons, is held annually under the direction of the Secretary of the Treasury. From those passing highest, provided they reach the required standard, a class is formed which is ordered to report for instruction at the Revenue Cutter Academy located at New London, Conn. The term at the academy covers a period of three years and comprehends a strict course of discipline and instruction in all matters pertaining to the professional requirements of an officer. A cadet receives $500 per annum and one ration per day and must provide himself with the prescribed uniforms. At the expiration of his probationary term of three years, if his deportment and progress have been satisfactory, he is rewarded with a commission as third lieutenant. An applicant for the position of cadet engineer must not be less than 20½ years nor more than 25½ years of age and must pass the same physical examination as prescribed for line cadets. They are required to serve a probationary term of one year as cadet engineers at the Revenue Cutter Academy before being commissioned third lieutenants of engineers. Cadet engineers receive a salary of $720 per annum and one ration per day and must provide themselves with the prescribed uniforms.

The work of the Revenue Cutter Service, as defined by law, consists in the enforcement of about every statute bearing upon the maritime interests of the nation. Its duties embrace the protection of the customs revenue; the saving of life and property from marine disasters; the destruction of derelicts; the enforcement of the laws against smuggling, those pertaining to national quarantine, the neutrality laws, the navigation laws, including vessels' documents, and all requirements in regard to the rules for preventing collisions, officers' papers, steamboat inspection, and passenger service; the laws in suppression of piracy, robbery, and mutiny on the high seas; those for the protection of the seal fisheries and sea-otter hunting grounds in Alaska and for the prevention of illegal traffic in firearms, ammunition, etc., in that territory; the laws for the protection of wrecked property and the timber reserves of the United States; the laws for the suppression of the slave trade; those that require necessary life-saving appliances to be kept on board merchant vessels; the laws in regard to the anchorage of vessels in the ports of New York and Chicago, in the St. Mary's River, Michigan, etc., and the regulations to insure the safety of observers of and participants in regattas on navigable waters. Two revenue cutters are now annually detailed to patrol the ice fields in the North Atlantic during the months of March, April, May, and June. This patrol duty is done under international agreement, and the expenses are borne by the great maritime nations of the world. One revenue cutter is detailed to render medical and surgical aid to the men of the deep-sea fishing fleet in the North Atlantic. During the dangerous and inclement season, from December 1 to April 1 of each year, revenue cutters are, by direction of the President, required to cruise actively along the coast to afford aid to vessels in distress. Those detailed for such duty are provided with special supplies, including extra provisions for the shipwrecked, and are instructed to extend to all requiring relief such assistance as may be adapted to their condition and necessities. The cutters on the Great Lakes are, during the period of open navigation, charged with similar important work. An important function of revenue-cutter officers is their connection with the Life-Saving Service (q.v.). They are detailed to do the inspection work of the latter and to drill the surfmen in the use of life-saving apparatus and to see that the equipments of the stations are kept in efficient condition. Besides the fixed duties of the service there are numerous others which it is called upon to perform from time to time, such as aiding the Public Health and Marine Hospital Service, the Lighthouse Establishment, the Coast Survey, the Fish Commissioner, the ocean telegraph lines, etc. Each vessel has assigned to her a certain district, within which she carries out her specified duties. The districts on the Atlantic and Pacific seaboards and the Great Lakes are contiguous and therefore cover the entire coast of the United States.

On Jan. 28, 1915, the bill creating the Coast Guard by merging the then existing Revenue Cutter and Life-Saving services into one organization became a law. Hereafter this service will be administered by the captain commandant, under the direction of the Secretary of the Treasury, in time of peace. In war times the Coast Guard will automatically become a part of the navy and be under the administration of the Secretary of the Navy. Under the terms of the bill the former Life-Saving Service is placed upon a military basis, and its members can now be retired for age, 30 years' service, or for disability incurred in line of duty. The Coast Guard is defined by law to be a part of the military service of the government at all times.

REVER′BERATORY FURNACE. See Copper, *Refining;* Iron and Steel; Lead; Metallurgy.

REVERDIN, re-vĕr′dăɴ′, Jacques Louis (1842–1908). A Swiss surgeon, born at Frontenex. He studied medicine at Paris (M.D., 1870), and settled in 1872 in Geneva, where four years later he became professor of pathology and surgery at the University. With Emil Theodor Kocher (q.v.) he was the leading investigator in goitre. Reverdin was able to produce in 1882 experimental myxœdema (*myxœdème opératoire*) by total or partial extirpation of the thyroid gland and thus became, with Kocher and Schiff, the originator of oganotherapeutics. He is the author of *Etude sur l'uréthrotomie interne* (1870); *Conférence sur l'extirpation du goître* (1886); *Contribution à l'étude de myxœdèmc* (1887); *De l'énucléation dans le traitement de goître* (1892); *Antisepsie et asepsie chirurgicales* (1895). Reverdin edited the *Revue Médicale de la Suisse Romande.*

REVERE, rē̇-vēr′. A city in Suffolk Co., Mass., adjoining Boston on the northeast, on the Boston and Maine Railroad (Map: Massachusetts, F 3). It is finely situated on the coast and is an attractive residential place and a summer resort. Revere Beach has a bathhouse built and maintained by the State, and a splendid beach of white sand which makes it one of the most popular bathing resorts on the Massachusetts coast. It has also a splendid boulevard. There are a handsome city hall and a Carnegie library. Revere was settled in 1626 and, under the name of Rumney Marsh, formed a part of Boston until 1738. Incorporated as Chelsea in 1739 and reincorporated as North Chelsea in 1846, it received its present name (in honor of Paul Revere) in 1871 and its city charter in 1915. Pop., 1900, 10,395; 1910, 18,219; 1915 (U. S. est.), 22,344.

REVERE, rā′vȧ-rȧ, Giuseppe (1812–89). An Italian poet, born at Triest. He wrote for *La Concordia*, a liberal journal of Turin, took part in the Cinque Giornate of Milan (1848), and afterward lived in Turin, Genoa, and Rome. He began his career with *Lorenzino de' Medici*, later utilized by A. Dumas (*Une nuit à Florence*), *I Piagnoni e gli Arrabbiati, Il Marchese de Bedmar*, literary dramas of historical realism, not destined for the stage. His verses, *Sdegno ed affetto* (1845), as well as his best work, *Marine e paesi* (1858), have a conscious affiliation with the mood and methods of Heine.

But he had also great ability as a humorist. Consult L. Cambon, *G. Revere* (Trieste, 1905).

REVERE′, Paul (1735–1818). An American patriot, born in Boston, Mass. He learned from his father the trade of a goldsmith and soon became skillful as an engraver on silverware. In 1756 he served as a lieutenant in the Crown Point expedition and, returning to Boston, established himself as a goldsmith and a copperplate engraver. He was a member of the grand jury which in 1774 refused to serve on account of the Act of Parliament making judges independent of the Legislature as regards salary. He engraved the plates and printed the paper money ordered in 1775 by the Provincial Congress and in the same year established a powder mill in Boston. He early took an active interest in the disputes with the English ministry, participating in the Tea Party (1773) and carrying the news of it to New York and Philadelphia, and in 1774 became a member of a society organized to watch the British in Boston. On April 18–19, 1775, at the request of Joseph Warren, he made his memorable midnight ride to Lexington to warn Hancock and Samuel Adams of the approach of English troops. Then, passing on towards Concord to warn the people there, he was captured by a party of British soldiers and was brought back to Lexington, where he was released on the next day. This ride has been the theme of a celebrated poem, "The Midnight Ride of Paul Revere," by Longfellow. Subsequently becoming lieutenant colonel of State artillery, Revere accompanied the unsuccessful Penobscot expedition in 1779. Consult C. F. Gettemy, *True Story of Paul Revere* (Boston, 1905).

REV′ERIE, or **REV′ERY** (Fr. *rêverie*, OF. *resverie*, from *resver*, *rêver*, *rever*, to rave, from Lat. *rabies*, rage, from *rabere*, to rage). A word borrowed from the French and somewhat loosely used to signify a state of mind obtaining during waking life and characterized by neglect of present surroundings, meditativeness, or abstraction. True reverie, like the dream of sleep, is marked by a condition of discursive, passive attention. There is, to be sure, abstraction, forgetfulness of one's environment, but the trend of consciousness is not towards any definite goal. Like the dream, too, the reverie is apt to be fleeting and easily forgotten. Its fancifulness and fleetingness are evidence of the lack of a determining tendency (q.v.). Consult James, *Text-Book of Psychology* (New York, 1892), and Carpenter, *Mental Physiology* (London, 1888). See Attention; Association of Ideas; Dreaming; Hypnotism.

REVERS′ING LAYER. The gaseous layer of the solar atmosphere lying between the photosphere and the chromosphere (qq.v.). It was discovered by Young during the Spanish eclipse of 1870. Its temperature is lower than that of the photosphere, and consequently selective absorption takes place in the white light of the photosphere as it passes through the reversing layer, and the resulting spectrum is found to be a continuous one crossed by innumerable fine dark lines corresponding to the wave lengths absorbed. Many of these lines have been identified with those due to terrestrial elements, about 40 of which have thus been shown to be present in the sun. If the light from the limb of the sun is examined during a total eclipse through a spectroscope which has its slit arranged parallel to the limb, the spectrum obtained fades away as the moon advances over the sun's disk, and at the instant of totality the spectrum of the reversing layer flashes out as a series of bright lines occupying the positions of the dark lines of the effaced spectrum of the photosphere. It has been estimated that the thickness of the reversing layer is from 500 to 1000 miles. See Spectroscopy; Sun.

REVER′SION (Lat. *reversio*, from *revertere*, to turn back, from *re-*, back again, anew + *vertere*, to turn; connected with Skt. *vart*, OChurch Slav. *vrŭtēti*, *vratiti*, to turn, Goth. *waírþan*, AS. *weorþan*, OHG. *werdan*, Ger. *werden*, to become). A form of heredity (q.v.). Cases occur where an individual inherits not its parents' physical or mental characteristics, but those of its grandparents or more remote ancestors. This happens in cultivated plants and domestic animals artificially bred from wild forms. If such forms are neglected or return to free nature, i.e., run wild, they tend to revert, throw back, i.e., to transmit the characteristics of the original wild species or variety. Darwin remarks that reversion may be divided in two classes: (1) those occurring in a variety or race which has not been crossed, but has lost by variation some character that it formerly possessed and which afterward reappears; (2) all cases in which an individual with some distinguishable character, a race, or species, has at some former time been crossed, and a character derived from this cross, after having disappeared during one or several generations, suddenly reappears. He gives extensive examples in illustration and concludes that a tendency to atavism is "an integral part of the general law of inheritance." Consult J. C. Ewart, *The Penicuik Experiments* (London, 1899), and Charles Darwin, *Variation of Animals and Plants under Domestication* (authorized ed., 2 vols., New York, 1900). See Atavism; Hybridity; Mendel's Law.

REVERSION. The residue of an estate or interest remaining in a grantor of real property who has conveyed away one or more estates in it, amounting to less than a fee simple in quality and duration. Thus, where one seised of an estate in fee simple conveys the lands for life to another without making any final disposition of the fee, he is said to be seised of the fee in reversion. The reversion is classed as a future estate or, more accurately, as an estate of future enjoyment, and is said to arise by operation of law, i.e., without special act of the parties, and in this respect it differs from a remainder, which must be created by express words in a conveyance. Consult the authorities referred to under Real Property. See Remainder.

REVERT′ER, Possibility of. A species of reversionary interest or estate in real property, so named because of the extreme improbability of its ever ripening into or becoming an estate in possession. In early times the term was applied to the interest of a grantor who had conveyed either an estate in fee tail, i.e., an estate in the grantee and his lineal heirs, or a mere life estate; but, because of the remoter possibility of reversion when the fee had been disposed of, the term became restricted to the interest of the grantor in the event of the natural termination of an estate in fee tail. See Limitation of Estates; and consult authorities under Real Property.

REVET′MENT (Fr. *revêtement*, from *revêtir*, OF. *revestir*, to line, from *re-*, again + Fr. *vêtir*, OF. *vestir*, to clothe, from Lat. *vestire*, to clothe, from *vestis*, garment). An important device in both permanent and field military fortifications. In the former it is usually a retaining wall of masonry, built for the purpose of holding back or strengthening the earth of which the works are composed. In the older permanent forts it was usually about 5 feet thick at the top and sloping outward as it descends (on the ditch side only) about 1 in 6. Additional strength was obtained by reënforcing the revetment wall by massive buttresses at intervals of 15 feet, called *counterforts*, and these again were sometimes connected and strengthened by masonry arches outside the revetment. In field works the revetments are made of sods, sandbags, timber, brush woven or formed into hurdles, gabions, wattling or fascines, and even of masonry (q.v.). The revetments hold slopes more nearly vertical with consequent economy of material and increased protection for the troops in the trenches from indirect fire.

With the increase in the power of the attack, modern explosive shells will destroy most revetments, even if considerably strengthened. In view of this fact and of the great lengths of lines that must be built most field-fortification revetments are now of a simple economical type. See FORTIFICATION; REDOUBT; SIEGE AND SIEGE WORKS.

REVETMENT, OF RIVER BANKS. See MISSISSIPPI RIVER.

REVETT, NICHOLAS. See STUART, JAMES (1713–88).

REVIEW′ (OF., Fr. *revue*, from *revoir*, to review, from Lat. *revidere*, to see again, from *re-*, back again, anew + *videre*, to see). A military parade, followed by inspection and review, the latter usually consisting of a salute tendered to the reviewing officer as the troops "march past." This ceremony to-day is merely an exhibition of number, equipment, bearing, discipline, physique, and general condition and consequently is treated almost exclusively as a compliment to a distinguished visitor or as the finale to a field day.

REVIEW. See PERIODICAL.

RÉVILLE, rȧ'vĕl', ALBERT (1826–1906). A French Protestant clergyman and author, born at Dieppe (Seine-Inférieure). He studied at Dieppe, Geneva, and Strassburg; was for a time vicar at Nîmes, later pastor at Luneray, near Dieppe, and in 1851 became pastor of the Walloon Church at Rotterdam. In 1873 he returned to Dieppe, where he pursued philosophical studies until 1880. Thereafter till his death he was professor of the history of religions in the Collège de France. He also became president of the section of religious sciences in the Ecole Pratique des Hautes Etudes. Réville ranks as one of the most advanced representatives of the French liberal Protestantism of his time. His publications include a translation (1849) of Whately's *Introductory Lessons on the History of Religious Worship* (London, 1849); *Essais de critique religieuse* (1860; 2d ed., 1869); *Manuel d'instruction religieuse* (1863; Eng. trans., 1864); *Théodore Parker, sa vie et ses œuvres* (1865; Eng. trans., 1865); *Histoire du dogme de la divinité de Jésus-Christ* (1869; 5th ed., 1906; Eng. trans., 1870, revised 1905); *Histoire du diable* (1870; Eng. trans., 1871); *Douze sermons* (1874); *Prolégomènes de l'histoire des religions* (1881; Eng. trans., 1884); *Histoire des religions* (1883–85; Eng. trans., 1884), his most extensive and important work.

REVILLOUT, rȧ'vĕ'yōō', EUGÈNE (1843–). A French Egyptologist, born at Besançon. He was educated for the Church, but preferred Oriental studies, entered the department of Egyptian antiquities at the Louvre as an assistant in 1869, aided in founding the Ecole du Louvre in 1880, and in 1881 became professor and curator of the Egyptian collection of that museum. Revillout's great work was the publication of the *Chrestomathie démotique* (1878–80), supplementing Brugsch's discoveries in the demotic language. Besides, he specialized on Egyptian law, founded, with Brugsch and Chabas, the *Revue Egyptologique* in 1880, and published: *Actes et contrats des musées égyptiens de Boulaq et du Louvre* (1876); *Apocryphes coptes* (1876); *Le roman de Setna* (1880); *Etude complémentaire du cours de droit égyptien* (1884); *Corpus Papyrorum Ægypti* (1885–1902); *Cours de droit égyptien* (1885); *Cours de langue démotique* (1885); *Lettres sur les monnaies égyptiennes* (1895); *Mélanges sur la métrologie, l'économie politique et l'histoire de l'ancienne Egypte* (1895); *Précis du droit égyptien* (1899–1903); *Le procès d'Hermias* (1903); *L'Ancienne Egypte* (1908–09); *Les origines égyptienne du droit civil romain, nouvelle étude* (1912).

REVISED STATUTES. One of the forms in which the enactments of legislatures are published. In England it signifies a reprinting in chronological order of statutes in force, eliminating those which have become obsolete. In the United States it signifies not merely an elimination of useless material, but a rearrangement and systematization of the residue, bringing together laws relating to the same subject. In some States the expression is, however, not used with precision. English and American revisions have the common characteristic of presenting living laws in a more convenient form than that in which they were originally published.

The acts of legislative bodies are printed and bound into volumes at the end of each session and are then known as session laws. If there is more than one session of a given legislature, the laws passed at all sessions are usually republished, with a new title-page and indexes, and are then known as statutes at large. They include all acts whether general or local in character. As the number of these volumes increases the difficulty of determining what is the law on any subject increases, not only on account of the mechanical labor involved, but also because many laws have been repealed or amended or have become inapplicable to present conditions. In the United States there are three methods of meeting this situation—to codify, revise, or compile the laws. (See CODE.) In any case private and local acts are omitted from the new publication. Codification is the most thorough of the three, while compilation is a mere rearrangement of laws in force. Revision is "such a modification and amendment of the statute laws in existence, in addition to their rearrangement, as would render them consistent among themselves and in harmony with the constitution of the State. And when so amended, modified, and arranged, they are to be reported to the Assembly for adoption or modification." (27 Arkansas, 266.) The last revision of the laws of the United States Congress was published in 1878. Two supplementary volumes carry the revision to 1901. Nineteen States have chosen to issue revised statutes, the remainder preferring either codes or compilations. The revision is usually intrusted to agencies appointed by the Governor with or without the consent of the Senate, by one or both Houses of the Legislature, or by the Supreme Court. Some States leave the work to private enterprise, afterward adopting the work as their own. The period between revisions in some States has been as long as 20 years.

The last revised edition of the Laws of England was prepared by the Statute Law Committee and published by authority, 1888–1900, 20 volumes. The obsolete laws were cleared from the statute books by repeal bills passed on the recommendation of the Statute Law Committee before the revision was published. Consult for England, Sir C. P. Ilbert, *Mechanics of Law Making* (Oxford, 1914); and for the United States, "Revisions and Codes" in *American Law Review*, vol. xlviii (St. Louis, 1914).

REVIVAL OF LEARNING. See HUMANISM; RENAISSANCE.

REVIV'ALS (from *revive*, from Lat. *revivere*, to live again, from *re-*, back again, anew + *vivere*, to live), RELIGIOUS. A term widely used among Protestants since early in the eighteenth century, to denote periods of marked religious interest, when church members are quickened to a new sense of responsibility and privilege and others are for the first time brought openly to profess their faith. By an extension of its meaning the term is sometimes applied to various important religious movements of the past, like that of the Day of Pentecost (Acts ii), of the Wiclifites in England, the Hussites in Bohemia, and the Reformers of the sixteenth century. In a similar way it might be used of the religious zeal which led to the First Crusade, the work of the great monastic orders in some periods of their history, the Oxford movement, and so on. But it is more accurate and better to limit the application of the term "revival" to the history of modern Protestantism, especially in Great Britain and America, where such movements have flourished with especial vigor. Yet in so doing one should not forget that there were similar revivals of religion in Scotland as early as the end of the sixteenth century (under Wishart, Cooper, and Welsh), and again, both there and in the north of Ireland, about a generation later, when Bruce and Livingston were prominent as leaders (the Stewarton movement).

Seasons of religious quickening occurred in the Colony of Massachusetts Bay between 1704 and 1718, but in importance and influence they were far overshadowed by the work of Jonathan Edwards (q.v.) at Northampton in 1734. His preaching so deeply affected his hearers that about 300 persons were converted. The movement spread through a large part of New England in the next two years and formed a suitable introduction to the Great Awakening, a revival which extended through almost all the Colonies and influenced either directly or indirectly almost all the churches. This movement began about the same time as that of John Wesley in England. Its most active agent was George Whitefield (q.v.), a preacher of singular power and inexhaustible energy, who came from England to America in 1739 and traveled through the country, preaching in the open air to audiences of thousands and winning a large number of converts. The Great Awakening proper occupied the years 1740–42. Several evangelists were enlisted in its service, notably the zealous but censorious Gilbert Tennent (q.v.), a Presbyterian, who had begun revivalist work in New Jersey before Whitefield's arrival. Among the most obvious results of the Awakening were the addition, between 1740 and 1760, of 150 churches to the number already established in New England and the doubling of the number of Presbyterian ministers in the middle Colonies. Princeton College grew out of the movement, and the plan for a school for the education of the Indians was conceived about the same time, from which later came Dartmouth College (q.v.). The Wesleyan movement did for England what the Great Awakening did for America, but with a new and permanent ecclesiastical organization as its product.

Towards the end of the eighteenth century a fresh series of revivals began, lasting intermittently from 1797 to 1859. The beginning of this long period was called in New England the "evangelical reawakening." The work was carried on at first by parish ministers, not by traveling evangelists, and the churches soon came to depend upon revivals for their growth and even for their life. As time went on, the work was taken up by itinerant preachers also. Among the prominent leaders were Nathan Strong, Edward Dorr Griffin, Jeremiah Hallock, Timothy M. Cooley, Lyman Beecher, Asahel Nettleton, and Charles G. Finney. The early years of the nineteenth century were marked by great missionary zeal, reaching out beyond the boundaries of New England and even to foreign lands. See MISSIONS, CHRISTIAN.

Towards the southwest, in Tennessee and Kentucky, we meet for the first time with camp meetings, great open-air assemblies, which since 1800 have played an important part in the evangelistic work of the Methodist church. (See CAMP MEETING.) Ministers of other denominations at first participated in this movement, special sympathy being manifested by the Presbyterians, but the extreme excitement soon alienated them from it. A considerable number of Presbyterians, however, who continued to believe in the revival theory as there illustrated, withdrew from communion with the main body and formed the nucleus of what has since become the Cumberland Presbyterian Church. (See PRESBYTERIANISM.) One of the most valuable products of the camp-meeting idea is the Chautauqua Assembly, a highly successful educational enterprise, still closely connected with religious work. (See CHAUTAUQUA INSTITUTION.) One of the most noteworthy revivals of the whole series was that of 1858–59, which, like the Great Awakening, affected nearly all branches of Protestantism and was nowhere more successful than in New York City. No account of modern revivals would be complete without prominently mentioning the work of Dwight L. Moody and his singing associate, Ira D. Sankey (qq.v.), who for many years after 1870 exerted a large influence in Great Britain and America, reaching all classes of society.

What is commonly called the revival period of American religious history may be said to have closed soon after the middle of the nineteenth century. Horace Bushnell's work on *Christian Nurture*, published in its completed form in 1861, was undoubtedly a sign of the changing religious temper. Men's minds were turning to other ways of extending the Church's influence as being at once more normal and more promising. The establishment of several theological schools, like Andover, Bangor, Hamilton, Newton, and others, due largely to the interest evoked by the revivals early in the century, tended to promote this very change.

At the same time revivals have not wholly disappeared. The great Welsh revival of 1904–06 was a spontaneous expression of religious life which won many converts and morally transformed certain places. In America organized evangelistic campaigns have sometimes had great success, under the leadership of professional evangelists, among whom have been J. Wilbur Chapman, R. A. Torrey, "Gypsy" Smith, "Sam" Jones, and "Billy" Sunday.

Although revivals mark a temporary departure from the historic method of propagating Christianity, which is by religious training accompanying the sacrament of baptism, yet they are a natural incident in the development of Protestantism.

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REV'OCA'TION (Lat. *revocatio*, from *revocare*, to revoke, recall, from *re-*, back again, anew + *vocare*, to call). In law, the annulling, vacating, or cancellation of a legal instrument with intent to make it null and void in effect, or the withdrawal of an authority previously conferred. Where an instrument is made in good faith and without wrongfully affecting the rights of third parties, it is generally held to be irrevocable if it conveys property or rights to some one who pays for the same or accepts them as a gift.

The term is also applied to the recall of a right in real property created by license of the owner or occupier, and to the transfer of an estate in land by one who enjoys a "power of appointment" with reference thereto, such right being sometimes described as a power of revocation and appointment. See LICENSE; POWER; POWER OF APPOINTMENT.

REVOLT OF ISLAM, THE. A poem by Shelley (1818). The original title was *Laon and Cythna*, the names of the chief characters of the story.

REV'OLU'TION (Lat. *revolutio*, from *revolvere*, to turn over, from *re-*, back again, anew + *volvere*, to turn; connected with Goth. *walwjan*, AS. *wealwian*, Eng. *wallow*). In politics, a radical change in the fundamental constitution of a state, as opposed to reform, which implies a gradual transformation carried out in accordance with established principles and through legal forms. Usually, though not of necessity, it connotes a popular upheaval in which the will of the masses replaces for the time all laws and authority. The history of every nation presents instances where the organic growth of years and centuries has within a brief space of time been altered or destroyed by a people that has lost faith in the efficacy of orderly evolution. The English Revolution of the seventeenth century once for all established the rights of Parliament as against those of the King. The American Revolution, so called, freed the united English Colonies on the Atlantic seaboard of North America from the sovereignty of the English crown and made them free and independent States. The French Revolution (q.v.) of 1789 overthrew the Bourbon monarchy and after three generations of sequential struggles brought in the sovereignty of the French people. It also produced a profound effect on the constitution of society and the relation of peoples and sovereigns throughout Europe. By the Industrial Revolution (q.v.) is meant a fundamental change in the method of production from the domestic system worked by hand labor to the factory system operated by machinery. Consult, on the technical aspect of revolutions in the science of politics, J. W. Burgess, *Political Science and Comparative Constitutional Law* (new ed., 2 vols., Boston, 1902), and John Locke, *Treatise on Civil Government* (new ed., London, 1903); also, W. S. Lilly, *A Century of Revolution* (2d ed., ib., 1890). On its historical aspects, see the history of different nations.

REVOLUTIONARY TRIBUNAL. The name given to the court for the trial of political offenses instituted by the French Convention on the night of March 10, 1793. Danton and his associates considered that such a court had become necessary, inasmuch as the disasters which had befallen the national armies on the frontiers had led to dangerous conspiracies against the revolutionary government. Its members were chosen from the various departments, and their appointment was ratified by the Convention. Their function was to sit in judgment on all persons accused of crimes against the state, and from their sentence, delivered with appalling promptitude, there was no appeal. During the Reign of Terror, when Fouquier-Tinville (q.v.) was the public prosecutor, this tribunal acquired a fearful notoriety by doing away with almost all forms of justice and making itself the willing instrument of the Committee of Public Safety. After several changes in organization the Revolutionary Tribunal was finally abolished, May 31, 1795. See FRENCH REVOLUTION.

REVOLUTIONARY WAR. See UNITED STATES.

REVOLVER, MILITARY. A weapon all but obsolete in practical service, but once extensively used and of much disputed value, as was shown by its varying relative importance in the armies of the world. It perhaps found a greater sphere of usefulness in the United States cavalry than with any other troops in the world. The ordinary range of usefulness of the revolver is practically limited to 50 yards, the weapon itself being required to be strong enough to stop a man and, if possible, a horse. The proper calibre was long a puzzling problem, the proper solution depending on the intended use as well as convenient size and weight. The calibre .38 revolver used by the United States army until replaced by the calibre .45 pistol, fired a bullet lighter by nearly 30 grains than that of any other power, with the exception of those used by the Swiss dismounted officers, French officers, and the revolvers of the Russian model. This revolver gave excellent service for troops in the United States, but proved to be not sufficiently powerful for use in Philippine campaigns.

The calibre .38 revolver is provided with a revolving cylinder containing six chambers, and, in order to facilitate the loading of cartridges and the simultaneous ejection of the emptied shells, the cylinder is mounted upon a crane pivoted in the frame below the cylinder, so that on drawing the cylinder latch to the rear the cylinder swings to the left and downward out of its seat in the frame. Thus, all the chambers are exposed for loading, while the pressure against the end of the ejector rod under the barrel forces out the shells. This done, the cylinder is returned to its position in the frame and is automatically secured by the cylinder latch.

A similar type of revolver is the Smith and Wesson, which is equipped with an automatic shell ejector, so that when the revolver is opened by its clasp the barrel and cylinders tip downward, an action which simultaneously ejects the empty shells. This mechanism is one of the most important inventions ever made in connection with revolvers, and it has been adopted by practically all the revolver manufacturers throughout the world since the patents covering the invention expired. The Army Model No. 3, as made by Smith and Wesson, weighs 2½ pounds, is central fire, with a calibre of .44. It takes six cartridges and has a length of barrel of 6½ inches.

All modern pistols and revolvers use metallic cartridges. England adopted the Mark IV .445 Model revolver of the Webley and Scott Revolver Company in 1893 for the exclusive use of the British army and navy as well as the Indian and colonial forces. It weighs 2 pounds 3 ounces and has a 4-inch barrel. The cylinder may be locked or free as desired. The weapon combines the trigger action with the cocking action.

As stated under Pistol (q.v.), the revolver supplanted the old single-loading pistol and recently has been supplanted by the automatic pistol in practically every country. This new weapon possesses greater power, carries more rounds in its magazine, and can be reloaded more rapidly. The calibre is generally above .40. See Plate with Pistol.

REVUE DES DEUX MONDES, re-vụ′ dȧ dẽ mônd (Fr., Review of the Two Worlds). The most important French magazine, founded in 1831 by F. Buloz and conducted for a long time by Brunetière and after his death by Francis Charmes.

REWA KANTHA, rā′wä kän′tȧ. A political agency, India, subordinate to the government of Bombay. The agency controls 61 native states situated in the region of the Narbada (Rewa) and Mahi rivers. Total area, 4972 square miles. Pop., 1901, 479,065; 1911, 665,099. The principal towns are Nandod, Balasinor, and Lunavada.

REWARD (OF. *rewarder*, *reswarder*, *reguarder*, *regarder*, to regard, from *re-*, back + *warder*, *garder*, to watch, mark, heed, guard, from OHG. *wartēn*, Ger. *warten*, AS. *weardian*, Eng. *ward*; connected ultimately with Gk. ὁρᾶν, *horan*, to see). A compensation or premium offered by a government or a private individual to the public in general for the performance of a particular act specified therein. In England statutes forbid the offering or receiving of a reward for the return of stolen property under conditions protecting or sheltering the thief. In the United States compounding a felony is a crime, but the English statute prohibiting the receiving back of property believed to have been stolen, without investigation, is not generally followed. The offer of a reward may be made verbally, by writing, or in the newspapers, and when made to the public at large may be accepted by any one who may see the offer. The various States differ as to whether one performing the service without having seen or having knowledge of the offer is entitled to the reward. Where the offer of a reward is made in the newspapers, it may be withdrawn or revoked in the same way, and one who saw the offer, but did not see the revocation and performed the service called for, is not entitled to recover, providing the performance did not antedate the publication of the revocation. The general principles of unilateral contracts govern. One who goes to great trouble and expense to get the desired information, but does not succeed in doing so until after the offer is revoked, is without remedy. A police officer cannot recover a reward offered for the detection of a criminal if his efforts were in the line of his duties; but if his services were not in any sense official and were performed in his leisure time, he may claim such a reward just as any other individual could do. Consult the authorities referred to under Contract.

REWARI, or **RIWARI**, rē̇-wä′rē̇. The chief commercial town of the District of Gurgaon, Punjab, British India, 48 miles southwest of Delhi, at the junction of two railways (Map: India, C 3). It has a fine town hall, handsome Jain temples, and the interesting ruins of the fort of Gokulgarh. It is an important grain-distributing centre; sugar and salt are also exported, and great quantities of iron are imported for manufacturing purposes. Rewari dates from about 1000 B.C., when it was built near the site of an older town. Pop., 1901, 27,300; 1911, 26,920.

REWBELL (or Reubell), rẽ′bĕl′, Jean François (1747–1807). A French politician, born at Colmar, Alsace. He practiced law, became president of the corporation of advocates, and was elected as a deputy of the Third Estate to the States-General for the District of Colmar. In 1791 he became president of the Assembly, afterward was general secretary to the Directory of Haut-Rhin, and in 1792 was elected to the Convention. He was an opponent of the Jacobin Club, to whose suppression in November, 1794, he greatly contributed; was a member of the Committee of Public Safety; and was elected to the Council of Five Hundred. In November of 1795 he became a member of the Directory, of which he was president (1796–99). He sat in the Council of Ancients, but after the coup d'état of the Eighteenth Brumaire (Nov. 9, 1799) withdrew from public life.

REY, Jacobus Hendrick de La. See De La Rey, J. H.

REY, Nicholas. See Rej, Mikolaj.

REYBAUD, rȧ′bō̇′, Louis (1799–1879). A French author and politician, born at Marseilles. From 1846 to 1848 he was a deputy from Marseilles. In 1850 he became a member of the Academy of Sciences. Besides editing a *Histoire scientifique et militaire de l'expédition française en Egypte* (10 vols., 1830–36), he published *Etudes sur les réformateurs ou socialistes modernes* (1840; 7th ed., 1864), which won the Montyon prize; a satirical romance entitled *Jérôme Paturot à la recherche d'une position sociale* (1843), which had a great success; a satire on revolutionary ideas, *Jérôme Paturot à la recherche de la meilleure des républiques* (1848); about 20 novels; several books on the industry of Europe; *Mœurs et portraits du temps* (6 vols., 1853); *Scènes de la vie moderne* (1855); etc.

REYE, rē′*e*, THEODOR (1838–   ). A German mathematician, born at Cuxhaven and educated at Hanover, Zurich, and Göttingen (Ph.D., 1861). He was instructor and professor at the Polytechnikum at Zurich until 1870, when he became professor of geometry at the Technische Hochschule of Aachen. Two years later he was appointed professor at Strassburg and in 1908 retired. Reye became known as one of the chief exponents of pure geometry as developed by Steiner and Von Staudt. He is author of *Geometrie der Lage* (2 vols., 1868; 4th ed., 3 vols., 1899–1907); *Die Wirbelstürme, Tornados, und Wettersäulen* (1872); *Synthetische Geometrie der Kugeln* (1879); *Die synthetische Geometrie in Altertum und in der Neuzeit* (1886; 2d ed., 1899).

REYER, rȧ′yâr′, (LOUIS ETIENNE) ERNEST (1823–1909). A French composer. His real name was Rey. In 1850 he produced *Le Sélam*, a symphonic ode with chorus, set to a poem by Théophile Gautier. Several operas followed, one of the most conspicuously successful being *La statue* (1861). He was elected to the Académie in 1876 and about the same time succeeded Berlioz as librarian at the Paris Opéra. In 1862 he was made Chevalier of the Legion of Honor and Officer of that order in 1886. His compositions include operas, *Maître Wolfram* (1854), *Erostrate* (1862), *Sigurd* (1884), *Salammbô* (1890); cantatas, *Victoire* (1859), *L'Union des arts* (1862), *L'Hymne du Rhin;* male choruses; and a mass. Consult A. Pougin, *Musiciens du XIX siècle* (Paris, 1911), and H. Roujon, *Notice sur la vie et les traveaux de E. Reyer* (ib., 1911).

REYES, rā′yās′, BERNARDO (?–1913). A Mexican soldier, born in Nuevo León of a wealthy family. He was educated in France, entered the army, and rapidly rose to the rank of general. One of the ablest officers of the Díaz régime, he did much towards the development of the army. He became Governor of the State of Nuevo León and for a time was Minister of War and Marine. Eventually, however, Díaz began to suspect him, and after Reyes had headed a revolt he was banished (1909). He adhered to the movement of Madero (q.v.) in 1911 and after the triumph of the latter was a candidate for the presidency, but withdrew before the election. Later Reyes was arrested in San Antonio, Tex., for violating the neutrality laws, but was released. He returned to Mexico and tried to start a revolt, but failed and surrendered to the Madero government (December, 1911). In February, 1913, he was released from prison in Mexico City by the revolting cadets and, with Felix Díaz, headed the uprising against Madero. He was killed in the bloody fighting which ensued. See MEXICO, *History*.

REYES, RAFAEL (1852–   ). A Colombian statesman and soldier, born at Santa Rosa de Viterbo, Boyaca. With his brother he carried on extensive explorations over a large part of South America and added greatly to geographical knowledge. He was always active in politics and took part in the numerous internal struggles of the country. In 1885 he commanded the government forces during the uprising of that year. He was Minister of the Interior under President Núñez, Minister Plenipotentiary of Colombia to France and Switzerland, and delegate to the second Pan-American Conference in Mexico. He represented his government in the negotiations with the United States concerning the Panama Canal in 1904. The same year he was elected President of Colombia. During his administration he reëstablished order in the Republic, revived the nation's credit abroad, improved the administration of justice, reorganized the system of public instruction, and fostered the development of railways and public works. The people objected to his dictatorial policy, and he resigned in 1910. Afterward he endeavored to promote Pan-American friendship. His writings include: *Misión del Rafael Reyes* (1908); *Pro Colombia, Pro Ibero-América* (1912); *The Two Americas* (1914).

REYKJAVÍK, rā′kyȧ-vĕk′. The capital of Iceland, situated on the southwest coast of the island at the head of the Faxa Fiord (Map: Denmark, E 1). The houses are of wood, stone, or béton. It has a small cathedral, a university, a classical college, a theological seminary, and a medical school. Here is the house of the Althing, a museum, containing a library, a collection of Icelandic antiquities, a collection of natural-history objects, the archives, and a picture gallery. During the summer there is steam communication with Copenhagen. Pop., 1901, 6682; 1911, 11,593.

REYNARD (rā′nẽrd) **THE FOX**. The greatest mediæval beast epic, in which animals become the mouthpieces of human society. Versions of this epic are found in the chief languages of western Europe. The narrative is made up of stories derived from European folklore and of more or less literary survivals of the Æsopic fable. Though the first extant signs of the epic date back to 940 (*Ecbasis Captivi*), the various elements of the tale did not group themselves into a whole until the twelfth century. In the Latin *Isengrimus*, which is, however, mainly of literary origin, the animals already have specific names. The principal character is Reynard (from the Germanic Raginohard, meaning "the wily, the crafty one") the fox, whose deadly enemy is Isegrim (probably German *eisen* and *grimm*, signifying "strength," "endurance") the wolf. About these two and their bitter feud are found grouped Noble the lion, Bruin the bear, Tibert the cat, Baldwin the ass, Chanticleer the cock, Kyward the hare, etc. The fact that *Isengrin* was used in 1112 as the epithet of a man (one of the conspirators against Gaudry, Bishop of Laon) shows that the tale was popularly current at an early date. The French *Roman de Renard*, a lost version of which was probably the source of most of the other European versions, is a cycle of episodes in octosyllabic verse, compiled by various authors at various epochs. The narrative is there divided into "branches," 30 in number, which together constitute over 30,000 verses. The oldest manuscript of this compilation is of the end of the thirteenth century, but we have a German poem of the twelfth century, modeled on an earlier version of the same French work. Various "Trouvères" attempted to give shape to this material, though the romance never attained genuine unity. The names of three alone of these compilers have been handed down: Pierre de Saint-Cloud, Richard de Lison, and a clerk who called himself *Prestre de la Croix en Brie.* These names indicate that the Ile de France, Champagne, Normandy, and Flanders are the localities where the various parts of the poem took shape.

In the fourteenth century the story was again taken up and given a number of remodelings on French soil; chief among these are *Renart le Nouvel,* by Jacquemard Gelée, and the famous *Renart le Contrefet,* by an unknown clerk of Troyes. Here the romance has become a veritable compendium of moral, historical, and political ideas expounded by Reynard in conversation.

The romance was very popular in foreign lands. It was translated into Middle High German in 1180 by the minnesinger Heinrich der Glichesäre; it was imitated in Catalonia by Raymond Lully and given an English form (published by Caxton) and a Flemish form. Goethe modernized the German version in his *Reinecke Fuchs* (translated by T. J. Arnold). Mediæval art delighted in depicting scenes from *Renard.*

For a detailed bibliography, consult Ernest Martin, *Le roman de Renart* (Strassburg and Paris, 1882–87), and Potvin, *Le roman du Renard* (Paris, 1891). The best edition of the French version is that of Martin, given above; the German *Reinhart Fuchs* is edited by Reissinger (Halle, 1886), the Flemish verse version *Reinaert de Vos,* by Van Helten (Groningen, 1887), and Caxton's English version is edited by W. J. Thoms, for the Percy Society (London, 1844); a modern English edition is by Thomas Cartwright (New York, 1908). For questions of sources, etc., Léopold Sudre, *Les sources du roman de Renart* (Paris, 1893); F. S. Ellis, *History of Reynard the Fox* (London, 1894); Joseph Jacobs, *Reynard the Fox* (ib., 1895); Gaston Paris, "Le roman de Renard," in the *Journal des Savants* (Paris, 1895); Leopold Sudre, in Petit de Julleville, *Histoire de la langue et de la littérature française,* vol. ii (ib., 1896); also Thomas Carlyle, "On German Literature of the Fourteenth and Fifteenth Centuries," in the *Foreign Quarterly Review* (London, 1831).

REYNAUD, rā̇′nō̍′, JEAN ERNEST (1806–63). A French philosopher and author, born at Lyons. He was educated at the Ecole Polytechnique and was at first a mining engineer, but came into public notice as an opponent of Saint-Simonism, his previous creed, in a series of articles in the *Revue Encyclopédique.* His chief work, *Terre et ciel* (1854; 4th ed., 1864), is a résumé of the ideas he had already set forth in the *Encyclopédie nouvelle,* which he and M. Pierre Leroux had founded in 1835. He published also *Minéralogie des gens du monde* (1834); *L'Esprit de la Gaule* (1847; 2d ed., 1864); *Vie et correspondance de Merlin de Thionville* (1860); *Œuvres choisies* (1865).

REYNOLDS, rĕn′oldz, EDWIN (1831–1909). An American engineer, born at Mansfield, Conn. He served as general superintendent of Stedman & Co. at Aurora, Ind., in 1857–61, and of the Corliss Steam Engine Company at Providence, R. I., in 1871–77. Thereafter he was chief engineer and director of the Edward P. Allis Company and of the Allis-Chalmers Company at Milwaukee and Chicago. He was the inventor of the Reynolds-Corliss engine. In 1901 Reynolds was president of the Society of Mechanical Engineers.

REYNOLDS, JAMES EMERSON (1844–). An Irish chemist, born in Booterstown, County Dublin, and educated at Dublin University. He was chosen professor of chemistry to the Royal Dublin Society in 1870, to the Royal Irish College of Surgeons in 1873, and in Dublin University in 1875–1903. He served as president of the Society of Chemical Industry (1891), of a section of the British Association (1893), and of the Chemical Society, London (1902–03), and as vice president of the Royal Society in 1902. Reynolds discovered thiocarbamide and many other compounds of the same class and published *Lectures on Experimental Chemistry* (1874); *General Experimental Chemistry* (1880).

REYNOLDS, JOHN. See RAINOLDS, JOHN.

REYNOLDS, JOHN FULTON (1820–63). An American soldier, born at Lancaster, Pa. He graduated at West Point in 1841, was assigned as brevet lieutenant to the artillery, and during the Mexican War participated in the defense of Fort Brown, Tex., and the battles of Monterey and Buena Vista. At the outbreak of the Civil War he was commandant at West Point. He was commissioned brigadier general of volunteers in August, 1861, and was given a brigade of the Pennsylvania Reserve Corps before Washington. He took part in the seven days' battles before Richmond, showed brilliant tactics at Beaver Dam Creek, but was later captured at Gaines's Mill and afterward exchanged. The next year he took part in both the Peninsular and Northern Virginia campaigns and during the succeeding Maryland campaign commanded the Pennsylvania Volunteer Militia for the defense of his native State. In November he was given the command of the First Corps of the Army of the Potomac and was promoted major general of volunteers. He led the main attack on the Confederate left at Fredericksburg and at Gettysburg arrived on the field about two hours after the fighting had begun on the first day of the battle and was in chief command on the field until late in the morning (July 1), when he was shot and instantly killed by a Confederate sharpshooter.

REYNOLDS, JOSEPH JONES (1822–99). An American soldier, born at Flemingsburg, Ky. He graduated in 1843 at West Point, where from 1846 to 1855 he was a member of the faculty. In 1857 he became professor of mechanics and engineering at Washington University, St. Louis, but three years later gave up this position to become a merchant at Lafayette, Ind. At the outbreak of the Civil War he entered the Federal service as colonel of the Tenth Indiana Volunteers and a month later was commissioned brigadier general of United States Volunteers. In January, 1862, he again resigned, in August was again commissioned colonel, and in September was again promoted brigadier general. In November he was promoted major general and in 1863 participated in the battles of Chickamauga and Chattanooga. From Jan. 6 to June 16, 1864, he commanded the defenses of New Orleans, was in charge of the Department of Arkansas (1864–66), was mustered out of the volunteer service in the latter year, and was reappointed colonel of the Twenty-sixth Regular Infantry. A year later he was brevetted major general and in 1877 retired from active service.

REYNOLDS, SIR JOSHUA (1723–92). The principal founder of the school of English portrait painting. He was born at Plympton, Devonshire, July 16, 1723. His father, the Rev. Samuel Reynolds, rector of Plympton St. Mary, and master of the grammar school, intended his son for the medical profession. But in 1741 Joshua, who from an early age had manifested an ardent desire to be a painter, was placed under Hudson, the principal portrait painter of the day. After being in the studio of this artist two years he began on his own account to paint portraits at Plymouth Dock, now Devonport, and met with great encouragement. In 1745 he went to London and established himself in St. Martin's Lane, but on the death of his father, in 1746, he returned to Plymouth Dock. Upon the invitation of Commodore Keppel, who was in command of the Mediterranean squadron, he sailed for Italy from Plymouth in 1749 and on his arrival in Leghorn proceeded to Rome. He stayed about three years in Italy, most diligently employing his time in visiting the various cities where the chief art collections are to be found. Upon his return to London in 1752 his works attracted great attention, eclipsing everything that had been done there since Van Dyck's time. When the Royal Academy was instituted in 1768, he was elected president; he was knighted by George III and on Ramsay's death, in 1784, succeeded him as painter to the King. He founded the Literary Club (1764) for Dr. Johnson's benefit. To him Goldsmith dedicated his *Deserted Village*. He died in his palatial house in Leicester Square on Feb. 23, 1792, and after lying in state at the Royal Academy was interred in the crypt of St. Paul's.

Sir Joshua was very prominent in the social world and lived in friendly intercourse with Johnson, Burke, Goldsmith, Gibbon, Garrick, and other leading men of his period. His principal literary works consist of 15 *Discourses before the Royal Academy* (1778), treatises on the history of art of a high critical and artistic value. They are written in a precise good style and inculcate those maxims of art commonly known as academic.

Of formative influence in Reynolds's art were the great Italian masters, especially the Venetians, Correggio, the Bolognese Eclectics, and Michelangelo. He was much of an eclectic himself, and there was little that was strikingly original about his work. His composition and brushwork were learned, but his drawing, especially of the limbs, was often faulty. The strong point of his paintings was their color, showing the influence of Titian; but Sir Joshua's technical experiments had a disastrous result upon their preservation. His portraits are admirable realistic representations; the men are strong in action and character, the women gentle and attractive, the children innocent and natural. They form an epitome of London society of his day.

He is estimated to have painted from 2000 to 3000 portraits, most of which are in English private collections. The National Gallery, however, possesses a number of his best works, including those of Admiral Keppel, Lord Heathfield (the hero of Gibraltar), Goldsmith, Dr. Johnson, Garrick, the members of the Dilettante Society, and three portraits of himself. The National Portrait Gallery (London) and the Royal Academy are rich in his works, as are also the London private galleries and the University of Oxford. Especially worthy of mention are the portraits of Lady Cockburn and her children, the Duchess of Devonshire (Devonshire House), Nelly O'Brien (Hertford House), and "Mrs. Siddons as the Tragic Muse" (Dulwich Gallery).

Although Sir Joshua preferred historical painting, his works of this character are less important. There are good examples in the Hermitage collection, St. Petersburg, including the "Continence of Scipio"; the best, perhaps, is "Ugolino and his Sons in the Tower." Among his few genre pictures are the "Girl with the Mouse-trap" (Holland House) and the "Strawberry Girl." His beautiful and well-known "Angels' Heads" (National Gallery) are in reality portrait studies.

During the past decade many excellent examples of Reynolds's work have come into American possession. In the Metropolitan Museum, New York, are thirteen, including Master Hare, Mrs. Baldwin, and Lady Carew. The Morgan collection, on loan at the Metropolitan Museum, has two others, including Lady Betty Delmé and her children, excellent alike in composition and in color. The New York Public Library possesses Mrs. Ballington as St. Cecilia and two others. Among the best examples in private collections are Lady Milnes, Miss Finch-Hatton, and Miss Frances Harford in the Frick collection, New York; Sir John Read, Elkins collection, Philadelphia; Caroline, Viscountess Clifden, and her sister (H. C. Huntington, New York); Mrs. Clayton Glyn (Mrs. J. P. Morgan, New York); Lady Bunbury (Mrs. W. W. Kimball, Chicago).

Bibliography. Malone, *The Works of Sir Joshua Reynolds, Knight* (3 vols., London, 1798); James Northcote, *Life of Sir Joshua Reynolds* (2d ed., 2 vols., ib., 1818); Joseph Farrington, *Memoirs of the Life of Sir Joshua Reynolds* (ib., 1819); William Cotton, *Sir Joshua Reynolds and his Works* (ib., 1856); Leslie and Taylor, *Life and Times of Sir Joshua Reynolds* (2 vols., ib., 1865); Claude Phillips, *Sir Joshua Reynolds* (ib., 1894); Graves and Cronin, *History of the Works of Sir Joshua Reynolds* (4 vols., ib., 1899–1901); *Masters in Art*, vol. i (Boston, 1900); S. K. Bolton, *Famous Artists* (New York, 1902); R. S. Gower, *Sir Joshua Reynolds* (ib., 1902); Sir Walter Armstrong, *Sir Joshua Reynolds* (ib., 1905), one of the best and most critical; J. F. Molloy, *Sir Joshua and his Circle* (2 vols., ib., 1906); Max Osborn, "Joshua Reynolds," in *Künstler-Monographien* (Bielefeld, 1908).

REYNOLDSVILLE, rĕn′oldz-vĭl. A borough in Jefferson Co., Pa., 120 miles by rail northeast of Pittsburgh, on the Pennsylvania, the Reynoldsville and Falls Creek, and the Lake Shore and Michigan Southern railroads (Map: Pennsylvania, D 4). It is in a productive bituminous coal region and has silk mills, brick and tile works, a tannery, a macaroni factory, and an asbestos plant. Pop., 1900, 3435; 1910, 3189. Reynoldsville was greatly enlarged in 1913, when it annexed West Reynoldsville (pop. 993 in 1910) and three large adjacent areas.

REZNICEK, rĕz-nĭ′chĕk, Emil Nikolaus von (1861–). An Austrian composer, born at Vienna. He received his musical education from W. A. Remy at Graz and at the Conservatory of Leipzig. After holding various positions as theatre conductor at Graz, Zurich, Stettin, and Jena, he was appointed court conductor at Mannheim in 1896. In 1902 his series of "Orchester-Kammerkonzerte," at which he produced rarely heard works for a small orchestra, attracted favorable attention, and he began a number of successful tours as guest conductor. In 1906 he became a teacher in the Scharwenka Conservatory and in 1909 conductor of the Comic

Opera in Berlin. As a composer he is best known through his operas, of which *Donna Diana* (1894) achieved an unusual success. His other operas are: *Die Jungfrau von Orléans* (1887), *Satanella* (1888), *Emmerich Fortunat* (1889), *Till Eulenspiegel* (1902). He also wrote two symphonies, two symphonic suites, two symphonic poems (*Schlemihl* and *Friede*), a symphony with solo and chorus (*Der Sieger*), a requiem, a mass in F, two string quartets, piano pieces, songs.

RHACHITIS, rȧ-kī′tĭs. See Rickets.

RHAD′AMAN′THUS (Lat., from Gk. ‘Ραδάμανθος). A son of Zeus and Europa and brother of Minos (q.v.). In Homer (*Odyssey*, iv, 564) and the older epic, he is a hero, who by special favor of the gods has been translated, with others, to Elysium (q.v.) or to the Islands of the Blessed (q.v.). In later story these islands become the Kingdom of Cronos and the released Titans, and Rhadamanthus, married to Alcmene, mother of Hercules, holds high rank there and sits as judge. In a still later story Rhadamanthus, with Minos, Æacus, and Triptolemus, because of their justice in this life, sit in judgment on the souls of the dead and assign to them bliss or punishment.

RHADAMES, răd′ȧ-mēz. An oasis and town in north Africa. See Gadames.

RHÆTIA, rē′shĭ-ȧ, or, better, **RÆTIA.** A Roman province in the Alps, north of Italy and east of Helvetia, and bounded north by Germany and east by Noricum, thus embracing the Grisons and part of Tirol. It was watered by the Rhine, Athesis (Adige), and Ænus (Inn). The natives, chiefly engaged in herding sheep and cattle, were a hardy and warlike race, but were conquered, together with the Vindelici, about 15 B.C. by the Romans under Tiberius and Drusus. (See Horace, *Odes*, iv, 4 and 14.) Later Vindelicia, to the north, was united with Rhætia. The chief town of Rhætia was Tridentum (Trent); of Vindelicia, Augusta Vindelicorum (Augsburg). Consult M. B. Peaks, *The General Civil and Military Administration of Noricum and Raetia* (Chicago, 1907), and the article "Raetia," in Friedrich Lübker, *Reallexikon des klassischen Altertums*, vol. ii (8th ed., Leipzig, 1914).

RHAMNA′CEÆ (Neo-Lat. nom. pl., from Lat. *rhamnos*, from Gk. ῥάμνος, buckthorn, Christ's-thorn), Buckthorn Family. A family of about 50 genera and 600 species of dicotyledonous, often spiny trees or shrubs, natives of temperate and tropical countries. They have simple leaves and either fleshy or dry fruit. Some species have been used in dyeing (buckthorn), some in medicine (redroot), and the fruit of some for food. (See Jujube.) The chief genera of North America are *Rhamnus* (buckthorn) and *Ceanothus* (New Jersey tea, redroot, etc.).

RHAMNASE, răm′nās. See Enzyme.

RHAM′NUS. A genus of shrubs and trees. See Buckthorn.

RHAMNUS PURSHIANA. See Cascara Sagrada.

RHAMPHORHYNCHUS, răm′fȯ-rĭṉ′kŭs (Neo-Lat., from Gk. ῥάμφος, *rhamphos*, curved beak + ῥύγχος, *rhynchos*, snout). A fossil flying reptile of Upper Jurassic age. See Pterodactyl.

RHAMPHOSUCHUS, răm′fȯ-sū′kŭs (Neo-Lat., from Gk. ῥάμφος, *rhamphos*, curved beak + σοῦχος, *souchos*, crocodile). One of the largest fossil crocodiles. See Crocodile.

RHAMPSIN′ITUS (Lat., from Gk. ‘Ραμψίνιτος). A king of Egypt, the subject of a remarkable tale concerning a theft from his treasure house, related by Herodotus. Rhampsinitus is to be identified with Rameses III, whose treasury at Medînet Habu is the building referred to in the story of the thief. The accounts of Herodotus are derived from the popular tales and legends which in his time were current in Egypt.

Consult: Herodotus, ii, 121–124; J. G. Wilkinson, *Manners and Customs of the Ancient Egyptians* (London, 1878); G. C. C. Maspero, *Les contes populaires de l'Egypte ancienne* (Paris, 1906); J. H. Breasted, *A History of the Ancient Egyptians* (New York, 1908).

RHANGABÉ, RHANKAVES, or **RHANGAWIS**, räṉ′gȧ-vēs′. See Rangabe.

RHAP′SODISTS (from Gk. ῥαψῳδός, *rhapsōdos*, bard, from ῥάπτειν, *rhaptein*, to stitch together + ᾠδή, *ōdē*, song, from ᾄδειν, *adein*, to sing). In ancient Greece the name of professional reciters of poetry, especially wandering minstrels who recited the Homeric poems. So long as the Homeric lays were handed down orally, the rhapsodists were highly respected; they often exercised a considerable influence upon the text of the poems. But with the circulation of manuscript copies of the poems the character of the rhapsodists gradually changed, so that in the fourth century they are represented as stupid persons, with nothing to commend them but a retentive memory. Their recitations, however, were popular until a comparatively late period. The rhapsodist carried a staff and when reciting wore a crown. He commented upon the poet's meaning and discussed questions of interpretation. Each recitation was known as a rhapsody; hence this term is often applied to the separate books of the *Iliad* and the *Odyssey*. Consult: Plato's *Ion*, 530 B; R. C. Jebb, *Homer* (Boston, 1893); H. Browne, *Homeric Study* (London, 1905); Christ-Schmid, *Geschichte der griechischen Litteratur*, vol. i, part i (6th ed., Munich, 1912). See Homer.

RHAP′SODY (Lat. *rhapsodia*, from Gk. ῥαψῳδία, recital of poetry, portion of an epic recited at one time, from ῥαψῳδός, *rhapsōdos*, bard). A term in modern music, applied to an instrumental composition written in the form of a fantasia usually upon folk songs or national melodies. The rhapsodies of Lalo and Brahms and the Hungarian rhapsodies of Liszt have become famous.

RHATANY, răt′ȧ-nĭ (Brazil., Portug. *ratanhia*, from Quichua *ratuna*, the native name), or Rattany, *Krameria triandra* and *Krameria Ixina*. Half-shrubby plants of the family Polygalaceæ, natives of the cold sterile table-lands of the Andes in Peru and Bolivia. Their roots have been used medicinally as an astringent and tonic. When powdered and mixed with orris root or charcoal, the roots are used as a tooth powder. Rhatany root is exported chiefly from Lima, Peru. It is extensively employed in Portugal to color wines, the coloring matter in the roots being known as rhatanic acid.

RHA′ZES. The Latin name of Abu Bekr Mohammed ibn Zakariya al Razi. The most important of the mediæval Mohammedan physicians. He was born about the middle of the ninth century in the Persian city of Rai. Up to his thirtieth year he devoted himself to music and then took up the study of medicine at Bagdad. He became the head of a hospital at his native place and later at Bagdad. After his reputation was made he traveled, visiting different courts. He died either in 923 or 932. Much of Rhazes's knowledge was drawn from Greek sources, but he was more than a mere borrower and is famed as the first to describe smallpox and measles (in his book *Al jardarī wa'l haṣba*, several times translated into Latin, and into English by Greenhill, London, 1848). He is said to have written more than 200 works; the most famous was the *Kitāb al ṭibb al Manṣuri*, a general treatise on medicine in 10 books. The *Kitāb al ḥāwī* (*liber continentis*), a cyclopædia of medicine, was edited from his papers after his death. Both these works were translated into Latin in the fifteenth century, and *al ḥawi* into Hebrew at Brescia in 1486. Consult: Wüstenfeld, *Geschichte der arabischen Aerzte und Naturforscher* (Göttingen, 1840); Leclerc, *Histoire de la médecine arabe* (Paris, 1876); Carl Brockelmann, *Geschichte der arabischen Literatur*, vol. i (Weimar, 1898); C. I. Huart, *Histoire des Arabes* (Paris, 1913).

RHE′A (Lat., from Gk. Ῥέα). A Greek goddess representing the productiveness of nature and anciently identified with Cybele (q.v.). She was the daughter of Uranus and Gæa, wife of her brother Cronos, and mother of Zeus, Hades, Poseidon, Hera, Hestia, and Demeter. She had an ancient place of worship in Crete, where she gave birth to Zeus on Mount Ida.

RHEA (Lat., from Gk. Ῥέα, daughter of Uranus and Gæa). The generic and English name of a family of South American ratite birds allied to the ostrich, from which they differ in having the feet three-toed and each toe armed with a claw; also in being more completely feathered on the head and neck, in having no tail, and in having the wings better developed and plumed and terminated by a hooked spur. The wings are, indeed, more efficient than in any other of the Ratitæ, although unfit for flight.

Rheas are known to Brazilians as ema and to Argentineans as nandu, avestruz, or chueke. There are two species, of which the best known (*Rhea rothschildi*) is considerably smaller than the ostrich, standing about 3 feet high. It is uniform gray, except on the back, which has a brown tint. The male is larger and darker-colored than the female. The back and rump are furnished with long feathers, much inferior to those of the ostrich in beauty as plumes, but marketable as material for dust brooms and the like. The skins are made up into rugs, of which large numbers are fabricated in the neighborhood of Mendoza, Argentina. The rhea inhabits the great grassy plains of South America, southward of the equator, and abounds on the banks of the La Plata and its more southern tributaries. It is generally seen in small groups, usually associated with guanacos, and eating grass, seeds, berries (especially of *Empetrum*), worms, snails, and almost anything else it can swallow. It runs with great celerity, using its wings in aid. It is polygamous, one male securing possession of two or more females, which lay their eggs together in a mere hollow, where, when 20 or 30 are gathered, they are incubated by the cock.

NANDU (*Rhea rothschildi*).

A smaller and more recently discovered species (*Rhea darwini* or *pennata*) has light-brown plumage, each feather tipped with white. It inhabits Patagonia and extends northward along the base of the Andes to the edge of Peru, and differs from the other in many particulars. A third species has been catalogued, a dark local race, *americana*, in northeastern Brazil, closely related to the ordinary nandu.

Consult Sclater and Hudson, *Argentine Ornithology* (London, 1889), and Charles Darwin, *A Naturalist's Voyage around the World*, in Everyman's Library (New York, 1908). Excellent portraits and descriptions of the three forms may be found in the *Transactions* of the Zoölogical Society of London, vol. iv (London, 1862).

RHEA CYBELE. See CYBELE.

RHEA, or **RAMIE, FIBRE.** See RAMIE.

RHEA, or **REA, SILVIA.** A vestal virgin, the daughter of Numitor, and mother of Romulus (q.v.) and Remus, by Mars. When Amulius usurped the throne, the infants were exposed and Rhea Silvia was condemned to be buried alive for breaking the vow of chastity required of the vestals. She was also called Ilia. Consult, e.g., Livy, i, 4.

RHEES, rēs, (BENJAMIN) RUSH (1860–). An American university president and biblical scholar, born in Chicago. He was educated at Amherst College (A.B., 1883), where he was an instructor in mathematics in 1883–85, and at Hartford Theological Seminary, from which he graduated in 1888. After his ordination to the Baptist ministry in 1889, he was pastor of the Middle Street Church at Portsmouth, N. H., for three years. Subsequently he served as associate professor (1892–94) and professor (1894–1900) of New Testament interpretation at the Newton Theological Institution. In 1900 he became president of the University of Rochester, where he held, besides, the chair of biblical literature. In 1915 he was a delegate to the constitutional convention of the State of New York. From Amherst he received the degrees of M.A. (1897) and LL.D. (1900) and from Colgate that of D.D. (1901). His writings include *St. Paul's Experience as a Factor in his Theology* (1896) and *The Life of Jesus of Nazareth: A Study* (1900).

RHEGIUM, rē′jĭ-ŭm. See REGIUM.

RHEGIUM, PYTHAGORAS OF. See PYTHAGORAS OF RHEGIUM.

RHEGIUS, rē′jĭ-ŭs (Latinized form of his family name, *Rieger;* the form *Regius*, as if from *König*, king, is incorrect), URBANUS (1489–1541). A Protestant reformer. He was born at Langenargen on Lake Constance, studied at Freiburg, and at first was professor of rhetoric and poetry at Ingolstadt, and, under the guidance of Eck, the opponent of Luther. Later he turned to theology, entered the priesthood of the Catholic church, and became a doctor of theology at Basel. In 1520 his views underwent a change, and while cathedral preacher at Augsburg he wrote satirical pieces against the church and openly preached Lutheran views. In 1521 he was removed, but in 1524 was again preacher in Augsburg and so remained till the diet held there in 1530. He openly stood for the reform and in 1526 married. When the Emperor had silenced the evangelical preachers of the city, he accepted the invitation of Ernest, Duke of Brunswick-Lüneburg, to become pastor at Celle, where he labored until his death. In the eucharistic controversy he wavered, but finally decided for Lutheran views. His Latin works appeared at Nuremberg in 1561, three parts; his German in four parts, in 1562; again at Frankfort, 1577. Of these works the best known are: *Formulæ Caute Loquendi* (1535; in German, 1536; last ed. by Steinmetz, Celle, 1880); *Dialogue von der trostreichen Predigt* (1537), a devotional work much read even in the seventeenth century; *De Restitutione Regni Israelitici* (1536; Ger. trans.). Many of his works were translated into English in the sixteenth century. Consult his *Life* by C. H. Heimburger (Gotha, 1851); by G. Uhlhorn (Elberfeld, 1861); and Steitz, *Die Theologie des Urbanus Regius, speziell sein Verhältnis zu Luther und zu Zwingli, 1521–23* (Gotha, 1898).

RHEIDT, rīt. A town of Prussia. See Rheydt.

RHEIMS, or **REIMS**, rēmz, *Fr. pron.* răɴs. The capital of an arrondissement in the Department of Marne, France, situated on the Vesle, 98 miles by rail east-northeast of Paris (Map: France, N., J 3). The city must be described as before the great European War. (See below.) The vineclad Montagne de Rheims and adjacent hills rise on the south and west, and detached forts at various points surround the city. The mediæval ramparts have been replaced by tree-lined boulevards, but some of the ancient gateways have been preserved, of which the most noteworthy is the Porte de Paris. The town is well built, the material used being limestone of the district, which, with the prevalence of the older style of domestic architecture, gives the place a picturesque appearance. There are many quaint old houses. The most striking public building is the thirteenth-century cathedral, which, although it never had the towers of the original design, was one of the finest specimens of Gothic architecture. It is 453 feet long. The elaborate west façade, flanked by two towers, had 500 statues and a splendid rose window. Scarcely less beautiful was the north portal, with its sculptures. The cathedral is famous as the church in which the French kings were crowned. The eleventh-century Romanesque abbey church of St. Remy is of nearly equal size. Other interesting buildings are the hospital occupying the ancient abbey of St. Remy, the fifteenth-century archiepiscopal palace with a museum of sculpture, and a handsome hôtel de ville, begun in 1627, containing the public museum and library of over 100,000 volumes. The Porta Martis, a Roman relic, is a fine triple triumphal arch of the fourth century in a fair state of preservation. The chief modern educational institutions are the lyceum and a preparatory school of medicine and pharmacy. Rheims is one of the principal entrepôts for the wines of Champagne. It is a great centre of woolen manufactures.

Rheims is built on the site of Durocortorum, or Civitas Remorum, the capital of the Remi. On the Montagne de Rheims, south of the city, are a number of Gallo-Roman remains. Under the Frank rule Rheims was a place of much importance, and it acquired a religious interest from its having been the scene of the baptism of Clovis and his chief officers by the Bishop, St. Remy, in 496. In the eighth century it became the seat of an archbishopric, and from 1179, in which year Philip Augustus was solemnly crowned there, it was the place for the coronation of the kings of France down to the time of Charles X. The town suffered severely during the campaign of 1814 and on Sept. 4, 1870, was occupied by the Germans. In the European War which began in 1914 Rheims again suffered severely. It was bombarded time and again by the Germans and was a target for numerous aërial attacks. The cathedral was damaged to an irreparable extent. (See War in Europe.) Pop. (commune), 1901, 108,385; 1911, 115,178. Consult: Guillaume Marlot, *Histoire de la ville, cité et université de Reims* (3 vols., Rheims, 1843–45); J. Justinus (Baron Taylor), *Reims, la ville des sacres* (Paris, 1860); Alphonse Gosset, *Cathédrale de Reims* (ib., 1895); Soissons, "Reims and its Cathedral," in *Contemporary Review*, vol. cvi (New York, 1914).

RHEINBERGER, rīn′bĕrᴋ-ẽr, Joseph (1839–1901). A German organist and composer, born in Vaduz, Liechtenstein. He received the greater part of his musical education at the Royal School of Music, Munich, where he subsequently taught the organ, counterpoint, and composition. He was organist of St. Michael, conductor of the Oratorio Society, repetitor at the Court Opera, and court kapellmeister, and he was regarded as one of the greatest theory and organ teachers of his time. He died in Munich. His music is scholarly and refined, but lacking in inspiration. His compositions include: *Christophorus*, oratorio; *Toggenburg* and *Waldmorgen*, cantatas; *König Erich*, ballad for chorus with pianoforte; *Wittekind* and *Das Thal des Espingo*, chorus; the *Wallenstein* and *Florentine* symphonies; overtures, pianoforte, chamber, organ, and orchestral music; and the operas *Die sieben Raben* (1869) and *Türmers Töchterlein* (1873).

RHEINE, rī′*ne*. A town in the Province of Westphalia, Prussia, on the Ems, at the head of navigation, 24 miles by rail north-northwest of Münster (Map: Germany, B 2). It is known principally for its manufactures of cotton, jute, linen, tobacco, and machinery. Pop., 1900, 10,371; 1910, 14,403.

RHEINFELS, rīn′fĕls. The largest and one of the most beautiful of the ruined castles on the Rhine. It was built in 1245 by the Count of Katzenelnbogen, one of the petty barons of the Rhine. In 1794 the French gained possession of it and blew it up in 1797.

RHEINGOLD, rīn′gôlt, Das. The first division of Richard Wagner's music drama *Der Ring des Nibelungen*. It was first given in Munich, Sept. 22, 1869; in the United States, Jan. 4, 1889 (New York). See Ring of the Nibelungen.

RHENANUS, rȧ-nä′nụs, Beatus (1485–1547). A German classical scholar, whose real name was Bild von Rheinau. He was born at

Schlettstadt, Alsace, and, after studying at the University of Paris, spent most of his life in his native city. He was an intimate friend of Erasmus and wrote his biography. His works, which show great critical acumen, include editions of Pliny's *Epistolæ* (1514), Tacitus (1519), Tertullian (1521), and Livius (with Gelenius, 1535), the *editio princeps* of *Velleius Paterculus* (1522), from a manuscript which he had himself discovered at Murbach; and an historical work, *Rerum Germanicarum Libri Tres* (1531), which was considered the finest piece of historical research of his day. He was the first to question the authenticity of the *Dialogus* of Tacitus. Consult: Horawitz, *Beatus Rhenanus* (Vienna, 1872); *Des Beatus Rhenanus litterarische Thätigkeit* (ib., 1872); *Die Bibliothek und Korrespondenz des Beatus Rhenanus* (ib., 1874); Knod, *Aus der Bibliothek des Beatus Rhenanus* (Leipzig, 1889); J. E. Sandys, *A History of Classical Scholarship*, vol. ii (Cambridge, 1908).

RHEN′ISH ARCHITECTURE. See Romanesque Art, *Germany*.

RHENISH CONFEDERATION. See Confederation of the Rhine.

RHENISH PRUSSIA. A province of Prussia. See Rhine Province.

RHENSE. See Rense.

RHEOTROPISM, rē̇-ŏt′rō̇-pĭz'm (from Gk. ʽρεῖν, *rhein*, to flow + τροπή, *tropē*, turn). The imperfectly understood sensitiveness which enables plant organs, especially roots, to bend their tips either towards or away from the source of a current of water in which they are placed. Negative rheotropic curvatures are often merely gross mechanical effects of the force of the stream. But positive curvatives (i.e., towards the source) are undoubtedly due to a specific reaction on the part of the organ. Positive rheotropism of roots is exhibited well by seedlings of the radish, maize, and *Vicia sativa*. The response is apparently caused by the pressure of the flowing water, and, unlike other tropisms, the perceptive zone is not limited to the very tip, but extends back at least 15 millimeters. See Tropism.

RHE′SUS (Lat., from Gk. ʽΡῆσος). 1. A Bithynian river god, son of Oceanus and Tethys. 2. A Thracian ally of the Trojans, of whom the oracle declared that, if his white horses should drink the waters of the Xanthus or feed on the grass of the plain of Troy, the city would not be taken. As soon as Rhesus reached the Trojan territory, he was surprised and slain in his camp by Odysseus and Diomedes, and his horses were carried off. Consult *Iliad*, x, 434 ff., and Vergil, *Æneid*, i, 469–473.

RHESUS (from Lat. *Rhesus*, Gk. ʽΡῆσος, name of a river in the Troad, another in Bithynia, a king of Thrace, etc.). A small brown monkey (*Macacus*, or *Pithecus*, *rhesus*), common all over India. It is known as the Bengal monkey, or bandar of the Hindus. It moves about in large bands, ascending to the height of 8500 feet in the Himalaya, and is often protected and fed in the neighborhood of temples by the Hindu priests, although not universally regarded as sacred. This monkey is one of those most familiar in menageries, where it may be recognized by the straightness of its moderately long hair, by the tapering tail, about one-half the length of the head and body, and by the nakedness of the buttocks for some distance around the callosities. Cf. Macaque.

RHET′ORIC (OF. *rhetorique*, Lat. *rhetorica*, from Gk. ῥητορική, *rhētorikē*, rhetorical art, from ῥήτωρ, *rhētōr*, orator). Taken broadly, the science and art of communication in language. The tendency of modern textbooks, however, has been to broaden the scope of rhetoric to include everything pertaining to the art of composition.

Regarded from the scientific point of view. rhetoric properly belongs to that branch of knowledge which is concerned with the relations of men in society. In every community a great variety of activities go on simultaneously. One important group of these activities consists of all the processes by which men express themselves and convey their thoughts and feelings to their fellows. It includes not only the more primitive modes of thought conveyance, such as gesture, picture writing, and the like, but also the most highly elaborated modes, such as the arts of architecture, sculpture, music, painting, and oral and written speech. This large class may be subdivided in two ways: (1) according to the medium employed in the process of thought conveyance, and (2) accordingly as the emphasis is thrown upon the individual or the social phase of the process. The first method of classification leads to the differentiation of the several arts; the second to the distinction of processes mainly self-expressive from processes mainly communicative. The subject matter of rhetoric is thus seen to be distinguished from that of allied sciences by the fact (1) that its medium is language and (2) that the emphasis is thrown upon the phase of communication, i.e., upon prose. But although rhetoric is primarily the science of communication, it is still concerned to a large extent with questions of expression.

It is obvious, therefore, that the underlying problem of rhetoric concerns the reciprocal speech relations of the individual and the community. Of this problem there are three principal phases, as follows:

I. *Psychological problems* relating (1) to the nature of the writing or speaking man, (2) to the mental activities involved in the process of composing. Here arise questions regarding (*a*) the nature and genesis of expression, (*b*) the characteristics of genius, (*c*) the acquirement and cultivation of the speech habit, and (*d*) the factors operating in the experience of the individual to turn his self-expression into the communicative channel. The first of these questions was treated at some length by Darwin (q.v.) in his *Expression of the Emotions*, and by his opponents; the second, by Lombroso (q.v.) and others; and the third, by many recent psychologists. The fourth is as yet practically unexplored. It is obvious, however, to touch upon it briefly, that every successful writer or speaker is on one side receptive, on the other productive. As receptive he is a product of heredity and of the social environment, while as productive he exhibits the faculties of invention and social imagination.

II. *Social problems*, relating to the dynamic effect of speech upon the community of hearers or readers. The assumption which underlies discussion of the subject from this point of view is that language is preëminently the social bond. The main questions relate (1) to the typical modes of response on the part of individuals and groups of individuals in the community, (2) to the formation of social or public opinion. Diall (*Psychology of the Aggregate Mind of an Audience*, Terre Haute, 1897) has endeavored to show that the minds of an assemblage listening to a powerful speaker undergo a curious process called fusion, by which the auditors are reduced as it were to a single individual, whose characteristics are those of an impulsive youth. But it is important here to distinguish, as Tarde has done (*L'Opinion et la foule*, Paris, 1901), between a "crowd" and a "public," the associative principle of the former being physical, of the latter psychical.

III. *Formal problems*, relating to the medium of communication, viz., language, or, more precisely, discourse, i.e., language in organized form. The main problems concern: (1) the nature and origin of discourse; (2) the peculiar function of discourse, as (*a*) on one side the expression of the individual and (*b*) on the other the means of social interchange; (3) the structure or morphology of discourse in (*a*) its minuter forms (words, sentences, paragraphs, etc.), (*b*) its larger forms (whole compositions), (*c*) its typical modes (description, narration, exposition, etc.); and (4) the typical methods of distribution (books, newspapers, etc.). The formal aspect of rhetoric has been developed in considerable detail in ancient and modern treatises, but has not been consistently unified or properly connected with the other two phases. Of all the principles that have been advanced to explain the structural side of rhetoric, that of organic unity is perhaps most fundamental, and from it may be derived all of the usual rhetorical qualities. But the truth is that all such principles are derivative, not primary. A truly scientific exposition would demonstrate that the peculiar forms and qualities of any piece of discourse are the natural outcome of the interaction of the individual and society in the process of communication. An oration, e.g., is the product of two forces, (1) the impulse of the individual to a certain kind of self-expression, and (2) the demand of the social mind for a certain kind of communication. The oration is the meeting point of these two forces.

History. The art of rhetoric seems to have been founded by Corax of Syracuse (c.466 B.C.) and further developed by his pupil Tisias (q.v.). The Sicilian, Gorgias (q.v.) of Leontini, introduced the new method into Athens during his ambassadorship in 427 B.C. It was the Athenian orator Antiphon (q.v.), however, who first combined the theory with the practice of rhetoric. The great publicist Isocrates (q.v.) founded a school of rhetoric, which he called the "art of persuasion," that was famous from 390 B.C. until his death. The rhetoric of Aristotle (q.v.), composed about 322 B.C., contains contributions of the greatest value. The system of scholastic rhetoric which finally became established was formulated principally by the practical rhetorician Hermagoras (q.v.), who wrote about 110 B.C. His system was founded directly upon that of the Stoic philosophers. The most important representatives of his school were Hermogenes (q.v.) among the Greeks and Quintilian (q.v.) among the Latins. The former, who flourished about 170 A.D., composed, besides a *Manual*, a complete digest of the subject from the time of his master Hermagoras. Other names of importance in the later history of Greek rhetoric are Longinus (q.v.), who wrote an *Art of Rhetoric* about 260 A.D., the eminent sophist Dio Chrysostomus (q.v.), Dionysius of Halicarnassus (q.v.), Himerius (q.v.), and Aphthonius, who composed in the latter half of the fourth century exercises that were destined to supersede those of Hermogenes. (See GREEK LITERATURE.) With the advent of the Renaissance numerous rhetorics were composed based principally upon the *De Institutione Oratoria* of Quintilian. In English Leonard Cox wrote before 1549 an *Art or Craft of Rhetoryke*, which was soon followed by the *Art of Rhetorique* of Thomas Wilson (1553). In French the treatises of Tonquelin (1555) and Courcelles (1557) attained much popularity.

Bibliography. Richard Whately, *Elements of Rhetoric* (10th ed., New York, 1880); John Bascom, *Philosophy of Rhetoric* (2d ed., ib., 1888); A. E. Chaignet, *La rhétorique et son histoire* (Paris, 1888); Navarre, *Essai sur la rhétorique grecque avant Aristote* (ib., 1900); Volkmann-Gleditsch, *Rhetorik und Metrik der Griechen und Römer* (3d ed., Munich, 1901); Aristotle's *Rhetoric*, translated by Jebb and edited by Sandys (London, 1909); Lanson, *Conseils sur l'art d'écrire* (7th ed., Paris, 1909); Süss, *Ethos: Studien zur älteren griechischen Rhetorik* (Leipzig, 1910); G. E. B. Saintsbury, *History of English Prose Rhythm* (London, 1912). For useful modern manuals: G. R. Carpenter, *Elements of Rhetoric and English Composition* (New York, 1906); C. S. Baldwin, *College Manual of Rhetoric* (4th ed., ib., 1909); id., *Writing and Speaking* (2 vols., ib., 1911); A. H. Thorndike, *Elements of Rhetoric and Composition* (2d ed., ib., 1911); W. T. Brewster, *English Composition and Style* (ib., 1912); Baker and Thorndike, *Everyday English* (2 vols., ib., 1912–13); Robert Herrick, *Methods of Teaching Rhetoric* (Chicago, 1913); John Erskine, *Written English* (2d ed., New York, 1913).

RHETORIC, FIGURES OF. A term popularly applied to a large and heterogeneous class of language forms, all characterized by the fact that they are deviations from what is plain, literal, and straightforward. From ancient times figures have been regarded by rhetoricians as embellishments of speech, i.e., as conscious devices and ornaments. Figures are commonly said to give strength and beauty to style, but it would perhaps be truer to say that they have the power of arousing in the reader or hearer the same emotional and imaginative processes which gave birth to them in the mind of the writer.

Since the conceivable modes of departure from literal statement are almost infinite in number, it is obvious that an exhaustive enumeration of figures is difficult and a classification of them well-nigh impossible. The ancients, for whom the subject had a peculiar fascination, enumerated as many as 250 distinct species, and although modern writers, generally speaking, have been less prodigal in their invention, the *Arte of Poesie*, attributed to Puttenham (1589), names and defines 107. In recent textbooks the tendency is to limit the number to 10 or 12. The important figures are as follows:

I. **Figures of Imagery.** These are figures which arouse concrete images in the mind of the hearer. They are: (*a*) *Metaphor* (q.v.). Akin to metaphor, though distinct as being a legitimate development of semasiology (q.v.), is catachresis, in which a word is extended in meaning beyond its strict sense, as "a silver drinking horn." (b) *Allegory* (q.v.). (*c*) *Simile* differs from metaphor in that the resemblance between object and image which is assumed in metaphor is in the simile expressly stated by means of the word "like" or "as." Thus, "His face was a withered moon" is metaphor, but "All his face was white And colorless, and like the wither'd moon, Smote by the fresh beam of the springing east," is simile. (*d*) *Synecdoche* is a kind of metaphor in which the image is related to the object as a part to the whole, as the whole to a part, as genus to species, etc. Thus, in "All hands on deck," "hands" is used for "men." (*e*) *Metonymy* (q.v.) and synecdoche are so nearly alike that distinction between them is hardly worth preserving.

II. **Figures of Arrangement.** In these figures words, phrases, clauses, or sentences are disposed in some peculiar and striking way to correspond to peculiar sequences of thought. (*a*) *Climax* consists in the arrangement of words, clauses, or sentences in the order of their importance, the least forcible coming first and the others rising in importance until the last; as in this example: "It is an outrage to bind a Roman citizen; it is a crime to scourge him; it is almost parricide to kill him; but to crucify him—what shall I say of this?" (*b*) *Antithesis* occurs when corresponding parts of a sentence are so juxtaposed as to give force to contrasting ideas; as, "To err is human, to forgive divine." Both climax and antithesis may appear also in the arrangement of the larger units of composition, as paragraphs and complete essays, as well as in the smaller units of words, clauses, and sentences.

III. **Figures of Contradiction.** In these figures there is an apparent contradiction between the form of expression and the idea to be expressed. They are: (a) *irony* (q.v.); (*b*) *epigram* (q.v.); and (*c*) *hyperbole* (q.v.). Hyperbole may also be looked upon as a kind of metaphor. Of the figures defined or named above, four—metaphor, metonymy, synecdoche, and irony—are often called tropes, because in them a word is turned from its ordinary meaning or application. But the word is also applied to a figure of any kind expressed in a single word.

Among the figures which are less easy to classify may be mentioned the following: *Antiphrasis* (q.v.). *Apophasis, paraleipsis,* or *omission* is the pretended omission or passing over of what one is really mentioning. *Apostrophe* is a turning aside to address an inanimate object or a person not present. *Asyndeton* consists in the omission of connectives, as, "I came, I saw, I conquered." *Epanorthosis* is an effective correction of something which has just been said, as, "His fault—perhaps I should rather say his crime." *Epiplexis* is a figure in which a person seeks to move or persuade by means of gentle upbraiding. *Epiploce* is a climax consisting of several clauses so framed that the last part of one clause is repeated as the beginning of the next, as, "He not only spared his enemies, but continued them in employment; not only continued them, but even advanced them." *Epistrophe* is a figure by which successive clauses or sentences end with the same emphatic word or phrase, as, "Are they Hebrews? So am I. Are they Israelites? So am I. Are they the seed of Abraham? So am I." *Euphemism* (q.v.). *Interrogation* is the asking of questions, not to gain information, but to assert more emphatically the opposite of what is asked. *Litotes*, see ANTIPHRASIS. *Onomatopœia* (q.v.). *Personification* or *prosopopœia* is the representation of inanimate objects as living beings, as, "Necessity is the mother of invention." See ANACOLUTHON.

RHETT, rĕt, ROBERT BARNWELL (1800–76). An American politician, born at Beaufort, S. C. His name was originally Smith, but after entering public life he changed it for that of a prominent Colonial ancestor. He studied law and in 1826 became a member of the State Legislature. In 1832 he was elected Attorney-General of the State, and during the nullification agitation attracted wide attention by his radical advocacy of the theory of State rights, in which he outstripped Calhoun himself. In the fall of 1836 he was elected as a Democrat to Congress, sitting by reëlection until 1849 and taking a leading part in the acrimonious slavery debates. In 1850 he was elected United States Senator to fill the vacancy caused by the death of John C. Calhoun. He stoutly opposed all compromises on the question of slavery. In the heated campaign of the year 1852 he advocated the immediate withdrawal of South Carolina from the Union without consultation with other Southern States. The Union candidates were generally successful at the ensuing election. Rhett took the defeat as a personal rebuke, resigned his seat in the Senate, and retired to his plantation. In the Charleston *Mercury*, in which he purchased a controlling interest, he continued to advocate his extreme views, and in 1860 again came into prominence as one of the most radical members of the South Carolina convention which adopted the ordinance of secession, and was the author of its address to the people. In the Montgomery convention which met to organize a provisional government for the seceding States he was one of the most active delegates, and was chairman of the committee which reported the Confederate constitution. Subsequently he was elected a member of the Lower House of the Confederate Congress. After the war he settled in Louisiana. He was a delegate to the Democratic National Convention in 1868.

RHEU'MATISM (Lat. *rheumatismus*, from Gk. *ῥευματισμός*, liability to rheum, a flux, from *ῥευματίζεσθαι*, *rheumatizesthai*, to have a flux, from *ῥεῦμα*, *rheuma*, flux, flow, from *ῥεῖν*, *rhein*, Skt. *sru*, to flow). An acute or chronic disease characterized by painful local inflammations. It may be divided for convenience of description into the articular (that involving the joints) and the muscular varieties. Either form may be acute or chronic. Acute articular rheumatism is a constitutional disease, not contagious, and characterized by fever, pain, and inflammation in and around the joints and a tendency to involvement of the pericardium and endocardium. The joints are apt to be attacked in succession. Rheumatism is a disease of moist and temperate climates, and the acute articular form usually occurs in young adults, although children are not by any means exempt.

The close analogy that exists between acute rheumatism and certain of the infectious diseases has led many investigators to believe that it is due to a specific germ, in spite of the fact that no microörganism has as yet been found constantly associated with the disease. A more generally accepted theory is that it is due to some toxic material produced in the system as a result of defective metabolism, tonsillar inflammation, or certain bacilli, such as streptococcus and staphylococcus. The immediate exciting causes are exposure to wet and cold or a sudden chilling of the body. The symptoms begin suddenly, with pain and stiffness in the joints, followed by high fever and profuse acid sweats, the urine becoming high-colored, scanty, and abnormally acid. The affected joints are painful and tender, hot, red, and swollen. Swelling is apt to be most apparent in joints scantily covered with muscle, viz., the knee, wrist, elbow, ankle, and the joints of the hands and feet. One or more joints may be affected, and the disease travels from joint to joint. Acute rheumatism is distinguished by the number and severity of its complications. These affect principally the serous membranes of the body. Pericarditis (q.v.) is a common complication. Endocarditis (q.v.), which may become chronic, is also of frequent occurrence. Pleurisy (q.v.) with effusion is often seen in association with pericarditis. Less often bronchitis, pneumonia, and inflammation of the cerebral arteries occur. In itself acute articular rheumatism is not a fatal disease, and the majority of cases recover within a week or 10 days. Relapses, however, often occur, and weeks or months may pass before entire cure is attained.

Chronic articular rheumatism may result from an acute attack, but most frequently it arises independently in persons of advanced middle age. The causative elements are similar to those of the acute form, but the onset is insidious. It is most apt to attack those whose occupation exposes them to cold and damp. The joints gradually become painful and stiff, but the symptoms vary in severity from time to time; they are worse in the morning and are aggravated by damp weather. Late in the disease the joints become greatly distorted and almost immovable.

Muscular rheumatism is an affection of the voluntary muscles and of the fasciæ and periosteum to which they are attached. It is inflammatory in character and may be acute or chronic. In contrast to the articular variety, muscular rheumatism is never complicated by cardiac disease. It is a malady of adult life, is almost always due to cold and damp, and one attack predisposes to another. The first attack is generally acute. The onset is sudden, with pain in the affected muscles, with slight tenderness, and considerable stiffness and difficulty of movement, by which the pain is increased. Fever is absent or slight. The acute attack lasts about a week. When the disease reaches the chronic stage the attacks return frequently and finally become constant and aggravated when the weather is damp. This form of rheumatism is prone to involve particular groups of muscles, and different names have been applied to it according to its location. *Torticollis* (wryneck) is an affection of the muscles of the side of the neck, usually rheumatic. It is generally limited to one side, towards which the head is twisted. Another form is *lumbago* (q.v.).

For the treatment of acute rheumatism rest in bed is imperative. Local measures to relieve pain consist in wrapping the affected joints in cotton wool, upon which some anodyne liniment, such as belladonna or opium or oil of wintergreen, may be sprinkled freely. The drugs now used internally consist of salicylic acid and its derivatives, with acetanilide, antipyrine, or morphine to relieve severe pain. It is agreed, however, among the best authorities that no medicine has much control over the course or duration of the disease. The diet should consist of milk chiefly, either alone or diluted with barley water, lime water, or vichy. Lemonade is beneficial as a drink. In acute muscular rheumatism hot poultices applied to the parts affected will afford great relief. The modern view is that chronic arthritis is due largely to the absorption of toxins from small foci in the teeth, tonsils, or intestinal tract, e.g., the appendix. Drainage, or removal of pus foci, has certainly worked remarkable cures. When the focus is not discoverable an examination of the blood will often reveal, by the reaction of the serum to certain tests, the identity of the exciting organism. From this a vaccine is prepared which assists materially in the cure. Chronic rheumatism is best treated locally by friction with stimulating liniments. Relief is obtained both from pain and loss of function by exposure of the joints to superheated air in a specially devised apparatus. (See Hot-Air Treatment.) Electricity and hydrotherapy (q.v.) are useful in improving the circulation and nutrition of the joints. The static wave current, high-frequency electric currents, and vibratory massage are also used. Internally the most used drug is potassium iodide. The alkaline waters may be taken. Attention must be paid to the general health, and good food, warm clothing, and tonics, particularly cod-liver oil, iron, arsenic, and strychnine, are necessary to prevent relapses and recruit the strength.

RHEYDT, rīt, or **RHEIDT**. A town in the Rhine Province, Prussia, on the Niers, 28 miles northwest of Cologne (Map: Prussia, B 3). It has a handsome new town hall, statues of William I and of Bismarck, and a fine Hohenzollern fountain in the market place. It manufactures silks, woolens, velvets, machinery, cigars, paper, etc., and has dye works. Rheydt received municipal privileges in 1856. Pop. (commune), 1900, 34,034; 1910, 43,786.

RHIGAS, Konstantinos. See Rigas, Konstantinos.

RHIGOLENE, rĭg′ō-lēn. See Petroleum.

RHIN, răN, Bas- (Fr., Lower Rhine). A former frontier department of France, corresponding nearly to the present German administrative District of Lower Alsace in the Imperial territory of Alsace-Lorraine (q.v.). It was ceded to Germany in 1871 by the Treaty of Frankfort.

RHIN, Haut- (Fr., Upper Rhine). A former frontier department in the east of France, with the exception of the Territory of Belfort (q.v.), since 1871 comprehended within the German District of Upper Alsace. The Territory of Belfort is often called Haut-Rhine. See Alsace-Lorraine.

RHIND PAPYRUS. See Egypt, *Literature and Science.*

RHINE. The principal river of western Europe. It rises in southern Switzerland and flows in a general northwest direction through western Germany and Holland, emptying into the North Sea after a course of over 800 miles (Map: Germany, B 3). The Rhine proper is formed in the Canton of Grisons, eastern Switzerland, by two main head streams, the Vorderrhein and the Hinterrhein. The former, the larger of the two, rises on the north slope of the St. Gotthard group within 2 miles of the source of the Rhone, at an altitude of 7690 feet, and passes northeast along the base of the Glarner Alps till it meets the Hinterrhein coming from the south from the glaciers of the Rheinwaldhorn. The combined stream, swelled by numerous mountain torrents to a width of 45 yards, flows northward, separating Switzerland from Liechtenstein and Austria, and enters the Lake of Constance. It leaves the main body of the lake at the town of Constance and passes into the Unter See (Lower Lake) a short distance farther on. The Rhine now flows westward, becomes narrow and very rapid, finally (below Schaffhausen) plunging over a rocky precipice 70 feet high. Another and smaller fall is encountered at Zurzach, below which the Rhine receives its first great tributary, the Aar, which brings to it the waters of northwestern Switzerland. The river bed continues for some distance to be narrow and rocky, with several rapids. It continues its westward course to Basel, where it makes a sharp turn to the north and enters wholly into German territory, having formed the boundary between Germany and Switzerland from the Falls of Schaffhausen to this point. At Basel the river is 190 yards wide and is henceforth navigable without obstructions. It now flows on the boundary between Baden and Alsace through a wide and level flood plain in the great rift valley formed by the sinking of a great block between two high-lying blocks, the Vosges on the west and the Black Forest on the east. In this valley it passes Strassburg, Mannheim, Worms, and Mainz, and receives the Ill, the Neckar, and the Main. At Mainz the river makes a short turn to the west, and then at Bingen an abrupt turn to the northwest. It now enters upon the most romantic and celebrated part of its course, reaching from Bingen to Bonn, a distance of about 80 miles, all through Prussian territory. Of late years, however, the beauty of the stretch between Coblenz and Bonn has been marred by quarries, cement factories, etc. Here the river is much narrowed and winds between steep mountains rising often from the water's edge. The heights are crowned by the famous ruined castles and the slopes are covered with vineyards, this stretch being well known for the Rhenish wines. The chief town on the Rhine in this part of the course is Coblenz, at the confluence of the Moselle, the largest tributary from the left. After passing the Siebengebirge at Bonn the river and its valley again widen out, and from Cologne to its mouth the Rhine flows through a low, level country, turning gradually westward as it enters Holland. The largest city on its banks below Cologne is Düsseldorf. A short distance below Düsseldorf the Rhine is joined by the Ruhr from the right, and a little farther down it receives the Lippe, also from the right. Shortly after passing the Dutch boundary it divides into two arms, the southern and larger of which, known as the Waal, flows into the great delta of southern Holland, where it merges with the Meuse and the Scheldt. The northern arm divides again at Arnhem, the Yssel coursing north into the Zuider Zee, and the other arm flowing westward, parallel with the Waal. This latter arm, called Lek (Leck) below Wijk, pours its waters into the North Sea through the Nieuwe (New) Maas. At Wijk a narrow arm, which at first bears the name of the Crooked Rhine, branches out northward and flows past Utrecht, below which it is known as the Old Rhine. At Utrecht the Vecht branches out from this arm and flows into the Zuider Zee. The Old Rhine, which has barely the dimensions of a river, flows past Leyden and discharges into the North Sea a few miles north of Scheveningen.

Commercially the Rhine is probably the most important river of Europe, its valley being densely populated, with numerous important industrial cities, especially along its middle course and its large tributaries. Canals connect the Rhine with the Meuse, the Seine, the Saône, the Danube, and the Ems. The Rhine-Rhone Canal follows the course of the river from Strassburg almost to Basel, and is generally used instead of the river, whose current here is very swift. The shipping at the principal ports amounts to nearly 17,000,000 tons annually. The river is visited every year by from 1,000,000 to 2,000,000 tourists. The legends of the Rhine figure prominently in German folk literature.

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RHINE, CONFEDERATION OF THE. See CONFEDERATION OF THE RHINE.

RHINE-HESSE. A province of the Grand Duchy of Hesse (q.v.), Germany.

RHINE'LANDER. A city and the county seat of Oneida Co., Wis., 103 miles northwest of Green Bay, on the Wisconsin River, at the Pelican Rapids, which afford abundant water power, and on the Chicago and Northwestern and the Minneapolis, St. Paul, and Sault Ste. Marie railroads (Map: Wisconsin, D 3). It is the centre of a busy lumber district and has saw and planing mills, large paper and pulp mills, a refrigerator factory, a veneer factory, boiler and iron works, etc. Pop., 1900, 4998; 1910, 5637.

RHINE PROVINCE (Ger. *Rheinprovinz*, or *Rheinland*), or RHENISH PRUSSIA. The most densely populated province of Prussia, bounded by the Netherlands on the north, Westphalia and Hesse-Nassau on the east, Lorraine and the Palatinate on the south, and Luxemburg, Belgium, and the Netherlands on the west (Map: Germany, B 3). It covers an area of 10,425 square miles. About 43 per cent of the total area is under tillage. The chief agricultural products are rye, wheat, barley, oats, and potatoes. There are extensive vineyards along the Rhine and Moselle, and wine is exported on a large scale. The large coal fields to which the province mainly owes its industrial development are situated chiefly along the Ruhr and the Saar. The province produces annually upward of 25,000,000 tons. Iron, zinc, lead, copper, quicksilver, and manganese are mined. Salt, sulphur, and several kinds of stone and useful earth are also produced in considerable quantities. The production of different metal articles from locomotives and guns to needles and small tools ranks first among the manufacturing industries of the province. The textile branches have also attained a high state of development. Some of the textiles, such as the woolen fabrics of Aix-la-Chapelle or the silks of Krefeld, are foremost in the world. The Rhine Province has also extensive glass works, paper mills, chemical works, and tanneries, besides a number of sugar refineries, distilleries, and breweries.

The extensive trade of the province is greatly promoted by the excellent transportation facilities, especially the railways. There are over 2900 miles of railway. The chief commercial centres of the province are Cologne, Düsseldorf, Aix-la-Chapelle, Coblenz, and Duisburg. It is divided into the five government districts of Coblenz, Düsseldorf, Cologne, Treves, and Aix-la-Chapelle. The capital is Coblenz. The province is represented in the Prussian Landtag by 28 members in the upper and 62 delegates in the lower chamber. It returns 35 members to the German Reichstag. The population of the Rhine Province more than trebled during the nineteenth century. In 1816 it was 1,910,000; in 1900 it was 5,759,798; in 1910, 7,121,140. Nearly 70 per cent is Roman Catholic.

Consult: Mehlis, *Studien zur ältesten Geschichte der Rheinlande* (Leipzig, 1875–79); Karl Kollbach, *Rheinisches Wanderbuch* (2d ed., Bonn, 1897); Tille, *Uebersicht über den Inhalt der kleineren Archiv der Rheinprovinz* (Bonn, 1899–1902); Schwann, *Die Rheinlande von Mainz bis Koblenz* (Leipzig, 1900); Kerp, *Am Rhein* (Bielefeld, 1901); Otto Follmann, *Die Eifel* (ib., 1912).

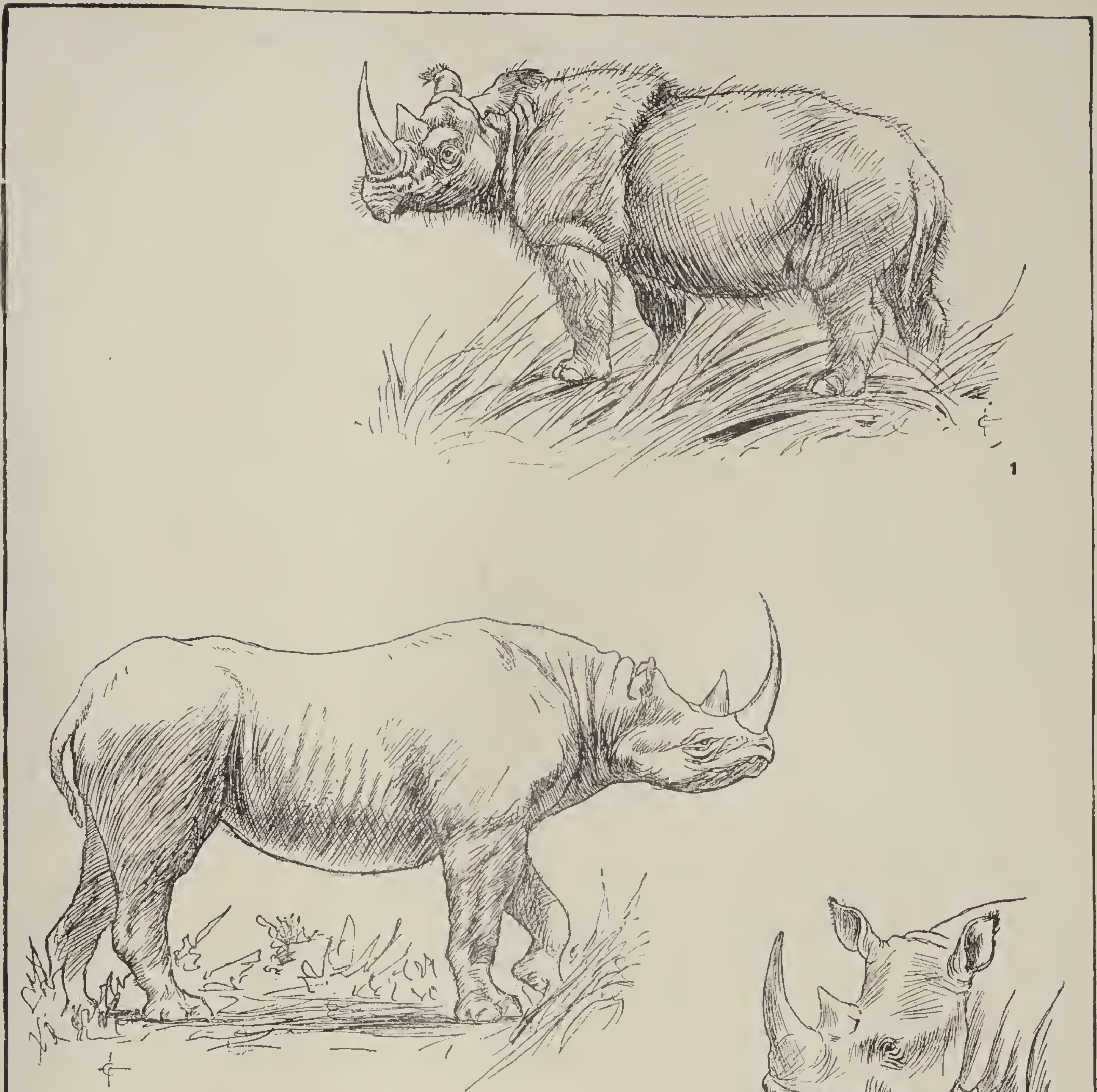
RHINI′TIS (Neo-Lat., from Gk. *ῥίς*, *rhis*, nose). Inflammatory disease of the mucous membrane of the nose; nasal catarrh. Low temperature, drafts, or mechanical irritants, together with certain bacilli combine to cause a hyperæmic swelling, with first a dryness, then an increased production of mucus and a transudation of serum into the blood vessels. Emigration of leucocytes may follow (see INFLAMMATION), and desquamation of epithelium from the mucous membrane may occur. The acute form of the disease is commonly known as "cold in the head." Many cases are due to contagion. The mucous membrane may remain thickened permanently, constituting what is known as hypertrophic rhinitis, or may become atrophic, so that an ordinary attack of rhinitis may terminate in three or four days or may pass into a chronic condition, continuing for months. This chronic form, however, is usually kept up by a coexistent inflammation of some of the accessory nasal sinuses. Some cases are caused by reflex irritation, the primary seat of trouble being in overstimulated sexual organs. In the treatment of acute rhinitis preparations of ammonium, belladonna, potassium citrate, ipecacuanha, camphor, carbolic acid, and saline cathartics are used, as well as alkaline or astringent topical applications. Similar treatment is used in cases of chronic rhinitis, besides surgical interference in the way of removal of hypertrophic tissue, both mucous membrane and bone, as well as the correction of intranasal deformities. Hay fever is sometimes classed as a rhinitis and is discussed under its own title. *Rhinitis ulcerosa* is considered under OZENA. Rhinitis is a symptom of measles, and sometimes complicates other infectious diseases, e.g., scarlet fever and diphtheria; and intestinal autointoxication is often a factor in the repeated attacks which some persons suffer.

RHINOCEROS, rī-nŏs′ẽr-os (Lat. *rhinoceros*, from Gk. *ῥινόκερως*, *rhinokerōs*, rhinoceros, nose-horned, from *ῥίς*, *rhis*, nose + *κέρας*, *keras*, horn). An animal of a family of perissodactyl ungulates (q.v.), the Rhinocerotidæ, closely allied to the tapirs, and containing the largest and most powerful of terrestrial mammals, except the elephants. There are five existing species, all natives of the warm parts of Asia, the Indian Archipelago, and Africa. The form of the rhinoceros is massive and uncouth. The limbs are thick and strong; each foot is terminated by three nearly equal toes, covered with broad hooflike nails, with a fourth nonfunctional toe on the front feet. The tail is small and terminated by a small tuft. The head is large, the muzzle prolonged, ears moderately large, eyes small, and nasal bones combined into an arch for the support of a horn or horns. The upper lip in most species is prolonged, pointed, and prehensile. The incisors are defective in the Asiatic species and, as well as the canines, wanting altogether in the African species; the molars and premolars are alike and highly effective as grinders. The skin is extremely thick and smooth, but soft and sensitive, although in the Asiatic species it has the appearance of a rigid armor, studded with tubercles and jointed in folds or wrinkles where necessary to permit movement of the head and limbs. The hide is used for making whips, harness, ropes, and so on, and when dried and hardened forms a material for shields capable of resisting spear thrusts and old-fashioned bullets. When properly dried and prepared it has the translucency and mottled appearance of tortoise shell, and from it are made various ornamental objects by East Indian artificers. The nasal horn or horns are formed of a solid mass of agglutinated bristles which spring from the skin of the nose, but are rooted upon a bony plate surmounting the skeleton of the nose. This horn is not only a powerful weapon, but with it the animal can root up and overturn bushes and small trees whose leaves and roots it seeks to eat.

The Indian rhinoceros (*Rhinoceros indicus*) formerly ranged over most of the peninsula, but is now restricted almost entirely to the Assam plain and lives chiefly in grassy jungles. It is the largest known species and sometimes exceeds 5 feet in height and 10 feet in length. The single horn is sometimes 2 feet long and 18 inches in circumference at the base. The Javanese or Sondaic rhinoceros (*Rhinoceros sondaicus*) is a much smaller species, also one-horned, found from Bengal to Java. Its armor has a tessellated appearance, and the female is hornless. The Sumatran or hairy rhinoceros (*Rhinoceros sumatrensis*) is so distinct that some naturalists have placed it in a separate genus (*Cetorhinus*). It ranges from northeastern India to Borneo, has a more hairy coat than the others, and two short blunt horns, one behind the other. A hairy-eared race (var. *lasiotis*) inhabits Assam.

The two species of African rhinoceros differ from the Asiatic ones mainly in the absence of incisor teeth and in the smoother unfolded skin, and they have each been put into a separate genus, *Diceros* and *Ceratotherium*, by some naturalists. The more familiar and widespread of the African rhinoceroses is the common or black one (*Rhinoceros*, or *Diceros*, *bicornis*), formerly abundant all over the eastern and

RHINOCEROSES



1. HAIRY RHINOCEROS (Dicerorhinus lasiotis).
2. AFRICAN RHINOCEROS (Diceros bicornis).
3. AFRICAN SQUARE-LIPPED RHINOCEROS (Ceratotherium simum).
4. INDIAN RHINOCEROS (Rhinoceros unicornis).

south-central parts of the continent, but now become rare and restricted. It is not black, but bluish lead-color, if anything rather lighter than the other species usually called white. This rhinoceros stands 5½ feet at the withers in the case of large males or bulls and has two horns. The front one, usually much the longer in South African examples, sometimes attains a length of more than 50 inches, but is always less in northern specimens. The rear horn varies from a mere knob to a length almost equal to its fellow and is usually straighter and much compressed. The upper lip is pointed, extensible, and prehensile, and this species feeds almost wholly on leaves, twigs, and roots. It frequents bushy and rocky districts rather than open plains. It spends the day in an accustomed lair well hidden from observation and starts at sunset for a drinking place along a well-trodden path. Having drunk, it will wander about, feeding during the night, will drink again at daybreak, and then return to its resting place. Some hunters regard this rhinoceros as naturally ferocious and vindictive, while others consider it stupid and timid but subject to sudden panics, in which it is as likely to rush headlong towards the hunter as away from him. At best, however, it is dangerous, and its speed and agility are extraordinary. The other African species, the white Burchell's or square-mouthed rhinoceros (*Rhinoceros simus*, or *Ceratotherium simum*), is larger than the *bicornis*, the biggest, indeed, of the entire tribe, and differs from the other prominently in having a blunt squarish muzzle, the upper lip not being at all prehensile. In conformity with this it is a grazing, not a browsing animal. Both species have been divided into several subspecies.

Fossil Rhinoceroses. The existing species are the lone remnants of a once numerous group that abounded in North America from Eocene to late Miocene time and in Europe from Eocene to Pliocene time. The fossil and living species may be grouped under three families. The Hyracodontidæ, represented by the genera *Hyrachyus* and *Hyracodon* of Eocene and Oligocene time, comprised hornless, lightly built animals adapted for running on the uplands. They show a tendency to reduce the number of functional digits of the feet from five to three and thus to parallel the evolution seen in the horse's hoof. The Amynodontidæ, comprising the American genera *Amynodon*, *Metamynodon*, and the European *Cadurocotherium*, were heavily built, short-bodied animals adapted to more or less aquatic habits of life. The skull was hornless, and the eyes were situated high on the head. The upper incisors are reduced, and the canine teeth are enlarged to form tusks for use in uprooting water plants. The true rhinoceroses (Rhinocerotidæ) began as light-limbed runners without horns, that lived at the same time as the members of the two preceding families. After the hyracodonts and amynodonts had become extinct the rhinoceroses began to adapt themselves to the habits of life of their predecessors and evolved along six different lines of descent. A gigantic animal, *Elasmotherium*, found in the Pleistocene deposits of northern Asia, thought to have descended from *Aceratherium*, attained a length of 15 feet and had two large horns in tandem and prismatic teeth. The woolly rhinoceros (*Atelodus antiquitatis*) is found fossil in the Pleistocene deposits of England and in the cave deposits of Europe, and its complete carcasses have been obtained from the frozen mud banks of the tundras of northern Siberia. It was a large two-horned species, with a heavy fur of coarse woolly hair.

Bibliography. The best general account of African rhinoceroses is by Theodore Roosevelt in his *Life Histories of African Game Animals* (New York, 1914). Consult also: W. T. Blandford, *Fauna of British India: Mammals* (London, 1888–91); Baker, *Wild Beasts and their Ways* (ib., 1890); Hornaday, *Two Years in the Jungle* (New York, 1885); Drummond, *Large Game . . . of Southeast Africa* (Edinburgh, 1875); and similar books of naturalists and sportsmen relating to southern Asia and Africa; H. F. Osborn, "The Extinct Rhinoceroses," in *Memoirs of the American Museum of Natural History*, vol. i, part iii (New York, 1898); id., "Phylogeny of the Rhinoceroses of Europe," in *Bulletin of American Museum of Natural History*, vol. xiii (ib., 1900). See HUNTING BIG GAME, and Colored Plate of PACHYDERMS.

RHINOCEROS BEETLE. A name in the South for a large scarabæoid beetle (*Dynastes tityus*). It is most abundant in the Southern Atlantic States, but extends west to New Mexico and north to Cape May and southern Pennsylvania. It is a large beetle, nearly 2½ inches in length, and is stout. The male has two long horns, one extending forward from the head and the other from the thorax, from which fact it derives its popular name. The female resembles the male, but lacks the horns. It is pale bluish gray in color and the wing veins are marked with darker irregular spots. The egg is ⅛ of an inch in length and is laid in rich earth or decaying trunks of old trees of several varieties. The insect in all stages has a very strong and disagreeable odor.

A MALE RHINOCEROS BEETLE.

RHINOCEROS BIRD. 1. An oxpecker or buffalo bird (qq.v.), which settles upon the backs of rhinoceroses. 2. A hornbill.

RHINOCEROS HORNBILL. See HORNBILL.

RHI'NODER'MA (Neo-Lat., from Gk. ῥίς, *rhis*, nose + δέρμα, *derma*, skin). A small frog (*Rhinoderma darwini*) of Chile, remarkable for its bell-like voice and for the fact that the internal vocal sacs in the throat of the male are converted into nests for the eggs, which hatch there, whereupon the sacs become nurseries for the 5–15 tadpoles until they reach maturity. Consult Hans Gadow, "Amphibia and Reptiles," in *Cambridge Natural History*, vol. viii (London, 1901).

RHI'NOPLAS'TIC OPERATION (from Gk. ῥίς, *rhis*, nose + πλάσσειν, *plassein*, to mold).

When a portion or the whole of the nose has been destroyed by accident or disease, the deficiency may be restored by a transplantation of skin from an adjoining healthy part. After freshening the stump of the old nose a suitable flap of skin is dissected from the forehead until it hangs by a narrow strip or pedicle between the eyebrows. The flap is then twisted on itself so that its skin surface is outward while its raw surface is brought into position to correspond with the original stump, to which it is then accurately sutured. The raw surface left upon the forehead is covered by undermining the surrounding skin and bringing the edges together, or grafting portions of skin from other parts of the body upon it. This is the so-called Indian method. In the Italian method, first carried out by Tagliacozzi, the flap is taken from the arm, over the biceps, the arm being strapped into position and kept there until the graft has taken, when the pedicle is severed and the arm released. The results obtained by either of these methods are apt to prove unsatisfactory from a cosmetic as well as a functional standpoint. The engrafted tissue being unsupported by bony framework, generally shrinks into a formless mass, and difficulty is experienced in keeping the nostrils open. On the whole, a well-fitting artificial nose of celluloid or rubber is preferable in the majority of cases. Many ingenious modifications of the above methods have been tried, and American surgeons are rapidly developing great skill in the repair of these defects. Carter has modified the Indian method by first engrafting a piece of rib into the flap and suturing this into place after the bony graft has taken. Fingers have been used, the knuckle forming a tip. Flattened noses are successfully elevated by the transplantation of a thin section of bone taken from the rib or tibia and inserted under the skin so as to form a bony ridge. Consult F. H. Kolle, *Plastic and Cosmetic Surgery* (New York, 1911). See AUTOPLASTY; SKIN GRAFTING.

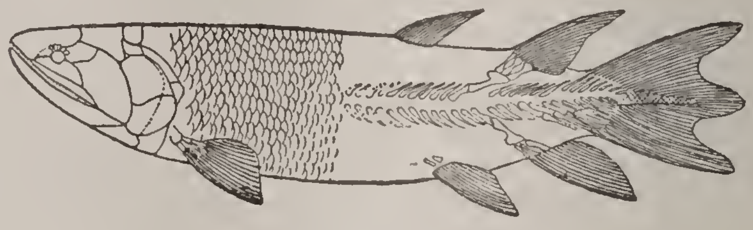
RHINS, răn, JULES LÉON DUTREUIL DE (1846–94). A French geographer and explorer, born at Saint-Etienne. He took part as a midshipman of naval volunteers in the expedition to Mexico and was an ensign during the Franco-Prussian War. From 1871 to 1876 he was captain of a foreign-going ship, in 1876–77 commanded the *Scorpion* of the King of Annam's navy, and in 1882 was Egyptian correspondent of the *Temps*. From 1891 to 1894 he explored Chinese Turkestan (East Turkestan) and the most inaccessible and least-known regions of northern and western Tibet. He was murdered by natives at a small town of eastern Tibet. His publications include: *Le royaume d'Annam* (1879); *Carte de l'Indo-Chine orientale* (1881); *Levé du cours de l'Ogooné* (1884); *L'Asia centrale* (1889). The results of his last journey were edited by his assistant, Grenard, *Mission scientifique dans la Haute-Asie* (3 vols., 1897–99).

RHINTHON, rĭn′thŏn (Lat., from Gk. Ῥίνθων) (c.325–c.285 B.C.). A Greek comic poet of Tarentum. He was the first to develop in a written form and to introduce into Greek literature the so-called Hilarotragœdia (Ἱλαροτραγῳδία), a species of burlesque tragedy in which the tragic myths were treated in the spirit and style of comedy. The *Amphitruo* of Plautus (q.v.) has been characterized as "an exalted *Rhinthonica*"; consult A. Palmer's edition of that play, page xv (London, 1890). Rhinthon is often quoted by Cicero and Varro and by Athenæus, Hesychius, and other Greek writers, but of his 38 dramas only insignificant fragments are extant. Consult Völker, *Rhinthonis Fragmenta* (Halle, 1887), and Christ-Schmid, *Geschichte der griechischen Litteratur*, vol. ii, part i (5th ed., Munich, 1911).

RHI′ZOCAR′PEÆ. See PALEOBOTANY.

RHI′ZOCEPH′ALA (Neo-Lat. nom. pl., from Gk. ῥιζοκέφαλος, *rhizokephalos*, having the flower growing immediately from the root, from ῥίζα, *rhiza*, root + κεφαλή, *kephalē*, head). An order of most degraded cirripeds, the root barnacles, especially of the genera *Sacculina* and *Peltogaster*. The few forms known are parasitic on the abdomens of various crabs.

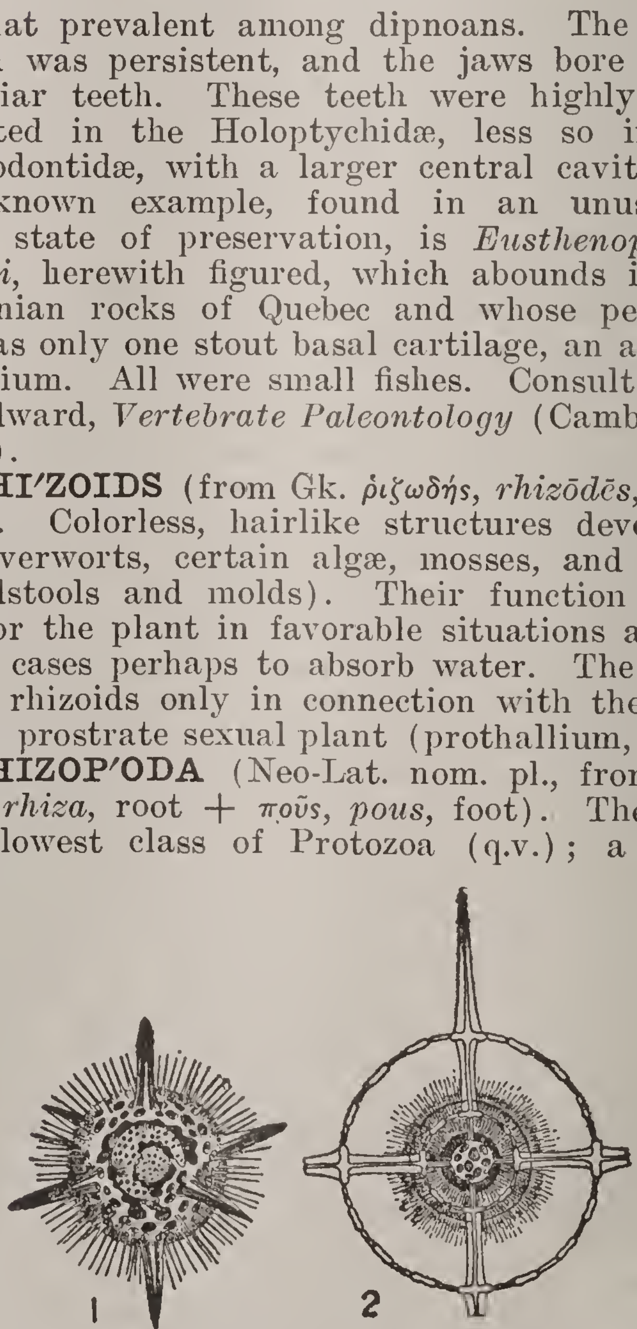
RHI′ZODON′TIDÆ (Neo-Lat. nom. pl., from Gk. ῥίζα, *rhiza*, root + ὀδούς, *odous*, tooth). A family of carnivorous Paleozoic fishes of the crossopterygian suborder Rhipidistia, in which the median fins are always more or less subdivided by a process of concentration analogous to that prevalent among dipnoans. The notochord was persistent, and the jaws bore many peculiar teeth. These teeth were highly complicated in the Holoptychidæ, less so in the Rhizodontidæ, with a larger central cavity. A well-known example, found in an unusually good state of preservation, is *Eusthenopteron foordi*, herewith figured, which abounds in the Devonian rocks of Quebec and whose pectoral fin has only one stout basal cartilage, an archipterygium. All were small fishes. Consult S. P. Woodward, *Vertebrate Paleontology* (Cambridge, 1898).



EUSTHENOPTERON FOORDI.

RHI′ZOIDS (from Gk. ῥιζώδης, *rhizōdēs*, rootlike). Colorless, hairlike structures developed by liverworts, certain algæ, mosses, and fungi (toadstools and molds). Their function is to anchor the plant in favorable situations and in some cases perhaps to absorb water. The ferns have rhizoids only in connection with the very small prostrate sexual plant (prothallium, q.v.).

RHIZOP′ODA (Neo-Lat. nom. pl., from Gk. ῥίζα, *rhiza*, root + πούς, *pous*, foot). The first and lowest class of Protozoa (q.v.); a large assemblage of varying forms agreeing in the possession of projections of the body protoplasm called pseudopodia. These pseudopodia are used



1, a radiolarian, showing the interior; 2, cross section of the same through the processes.

as organs of locomotion and also for obtaining food. They may be of very irregular and constantly changing shape or comparatively rigid, independent of each other or forming a very complex network. The protoplasm or sarcode of a rhizopod consists of an outer layer called ectosarc, which is thin, transparent, and homogeneous, and an inner portion called endosarc, which is granular and more opaque. Most of the numerous species are spherical with radiating pseudopodia, but the lowest forms have no constant shape. Most rhizopods are provided with some sort of shell, but the lowest forms have no such covering. The simplest shells are those made up of particles of dirt or foreign material of some sort, united together by some secretion of the ectosarc; in other cases the shell is formed of a horny material called acanthin or of carbonate of lime or silica, often in a very remarkable and elaborate pattern. Generally rhizopods are freely moving animals, but some are attached in adult life by stalks. The individuals are usually distinct, but colonial rhizopods are known, and such colonies are sometimes half an inch across.

The only internal organs of the Rhizopoda are the vacuoles, those which contain more or less digested food and those which contain the waste matter or excreta of the body. The latter are the larger and more conspicuous, and, owing to the sudden collapse when the excreta are thrown out of the body, are known as contractile vacuoles. Reproduction takes place by simple budding or fission, the two processes differing only in the relative size of the resulting individuals. The formation of spores, however, occurs in many cases, especially after a resting period. Such resting periods occur during unfavorable conditions such as prolonged cold or drought or when an unusual amount of food has been taken. In most cases during such a resting period the rhizopod surrounds itself with a firm, impervious coat, called a cyst. When the unfavorable conditions cease the sarcode divides up into several minute spores, each of which on the dissolution of the cyst becomes a new individual. The growth of these individuals is rapid when food is abundant. Consult: Joseph Leidy, *Fresh Water Rhizopods of North America* (Washington, 1879); Bütschli, "Protozoa," in Bronn, *Klassen und Ordnungen des Thierreichs* (Leipzig, 1887); M. M. Hartog, "Protozoa," in *Cambridge Natural History*, vol. i (New York, 1906).

RHODAMINE, rō′dȧ-mĭn *or* -mēn. See Coal-Tar Colors.

RHOD′ANUS. See Rhone.

RHODE ISLAND. One of the New England States of the United States, officially known as the State of Rhode Island and Providence Plantations, situated between lat. 41° 18′ and 42° 3′ N. and long. 71° 8′ and 71° 53′ W. Rhode Island is the smallest in area of the States of the United States. It has an extreme length from north to south of 48 miles and an extreme width from east to west of 36 miles. Its area is 1248 square miles, of which 1067 square miles are land surface.

Topography. The State belongs to the eastern Appalachian belt known as the Piedmont belt. It is rough and hilly, though the general elevation is not great, a small section only in the northwest being above 500 feet. The highest point is Durfee Hill, in Glocester, in the northwestern part; its altitude is 805 feet. The Atlantic coast line is bordered by lagoons and marshes, so that the approach to the State from the sea is possible only through the shallow Pawcatuck River in the southwest and in the east by Narragansett Bay, a large, irregular, and branching inlet extending 28 miles inland, with a breadth of from 12 to 3 miles. It incloses a number of islands, the largest of which are Aquidneck or Rhode Island, Conanicut, and Prudence Island. Aquidneck, with bold cliffs and fine beaches, containing the city of Newport, is a beautiful island, 15 miles long and 3 miles wide. Nine miles off the coast lies Block Island, 15 square miles in extent, made up entirely of morainic material, presenting in a typical manner the rough, rolling topography, and interspersed with numerous miniature freshwater lakes. The rivers of the State are small. The three largest are the Blackstone and the Pawtuxet in the north, flowing into the north end of Narragansett Bay, and the Pawcatuck in the south, flowing into the Atlantic Ocean on the Connecticut boundary. All of these are rapid streams, with a number of falls supplying considerable water power. Like all glaciated areas, the State is studded with numerous small lakes.

Climate and Soil. The climate is mild and equable compared with that of the interior of New England. Its position on the southern shore, protected from the cold winds striking the east coast of New England, is its main asset. The mean temperature for January is 36° and for July 76°. The average relative humidity ranges between 80 and 95 per cent throughout the year. The average rainfall is about 45 inches, ranging in localities from 40 inches in the north to nearly 50 on the coast. The soils are in general coarse, stony, and not well adapted for agriculture, but about 21 per cent of the State has a general-farming soil.

Geology. Archean rocks, chiefly gneisses, form the surface of the western half of the State to within 3 miles of Narragansett Bay. The Narragansett basin, including the bottom of the bay, its islands and both shores, together with a region running northeast into Massachusetts, forms an interesting patch of Carboniferous deposits. It seems to have been a shallow trough undergoing a continual subsidence as the coal beds and intervening strata were laid down, until the whole deposit attained a thickness of several thousand feet. The basin has since been subjected to folding movements, in which process the strata were crushed and faulted and the coal converted into graphitic anthracite and locally almost or wholly into pure graphite. These anthracite beds, worth about two-thirds as much as Pennsylvania anthracite, form the principal mineral deposits of the State, but access to large portions of them is difficult owing to the proximity of the bay.

Mining and Mineral Products. Rhode Island is of small importance as a producer of minerals. Quarries in the State in 1913 yielded stone to the value of $643,995. Other minerals produced on a commercial scale are mineral waters, lime, amorphous graphite, soapstone, coal, and clay products; the total value of such products was $813,952 in 1913.

Agriculture. Of an approximate land area of 682,880 acres, 443,308 acres were in farms in 1909. Improved land in farms amounted to 178,344 acres. The farms, numbering in that year 5292, averaged 83.8 acres in size. The average value of farm land per acre was $63.01. The total value of farm property, including land and buildings, implements and machinery, domestic animals, poultry, and bees, was $32,990,739.

Of the total number of farms 4338 were operated by owners and managers and 954 by tenants. The native white farmers numbered 4408 and the foreign-born white 843. There were also 41 negro and other nonwhite farmers. Of the foreign-born white farmers 161 were born in England, 150 in Canada, and 115 in Ireland.

The following table gives the acreage, production, and value of some of the leading crops as estimated by the United States Department of Agriculture in 1914.

CROPS	Acreage	Production in bushels	Value
Corn	11,000	462,000	$453,000
Oats	2,000	55,000	32,000
Potatoes	5,000	825,000	578,000
Hay	58,000	68,000*	1,374,000

* Tons.

In 1909 the total value of farm crops was $3,937,000. About one-third of this value was contributed by hay and forage. The leading crops in order of their importance are hay and forage, potatoes, corn, and oats. There were devoted to hay and forage 61,327 acres, which produced 80,306 tons, valued at $1,309,717; 9679 acres of corn, producing 398,193 bushels, $335,629 in value. The acreage of potatoes was 4649, the production 552,677 bushels, and the value $408,429. Oats, the only other crop to show a production valued at as much as $10,000, had an acreage of 1726, a production of 48,212 bushels, and a value of $28,661. Potatoes and other vegetables had an acreage of 9924 and a value of $1,045,000. Excluding potatoes, the acreage of vegetables was 5275, the value of the production being $637,000. Some 502 acres were devoted to flowers and plants and nursery products, the value of these products being $634,000. Strawberries are by far the most important small fruit. There were grown 326,540 quarts of them in 1909, and their value was $31,712. Raspberries are next in importance. The total output of small fruits was 437,560 quarts, valued at $43,033. Apples contributed about seven-eighths of the total output of orchard fruits. This fruit had in 1909 a production of 212,908 bushels, valued at $147,125. Peaches and pears are next in importance. The total value of orchard fruits was $197,639. There were also grown 152,937 pounds of grapes, which had a value of $9759.

Dairy and Live-Stock Products. The total value of domestic animals on farms in 1910 was $2,902,316. According to the estimates of the Department of Agriculture, there were on the farms on Jan. 1, 1915: horses, 10,000, valued at $1,460,000; milch cows, 23,000, valued at $1,663,000; cattle other than milch cows, 11,000, valued at $295,000; sheep, 7000, valued at $36,000; swine, 15,000, valued at $202,000. The total value of milk, cream, and butter fat sold, and butter and cheese made in 1909, was $2,065,941. Milk sold amounted to 8,796,847 gallons, valued at $1,903,546; the butter made to 339,607 pounds, valued at $104,161.

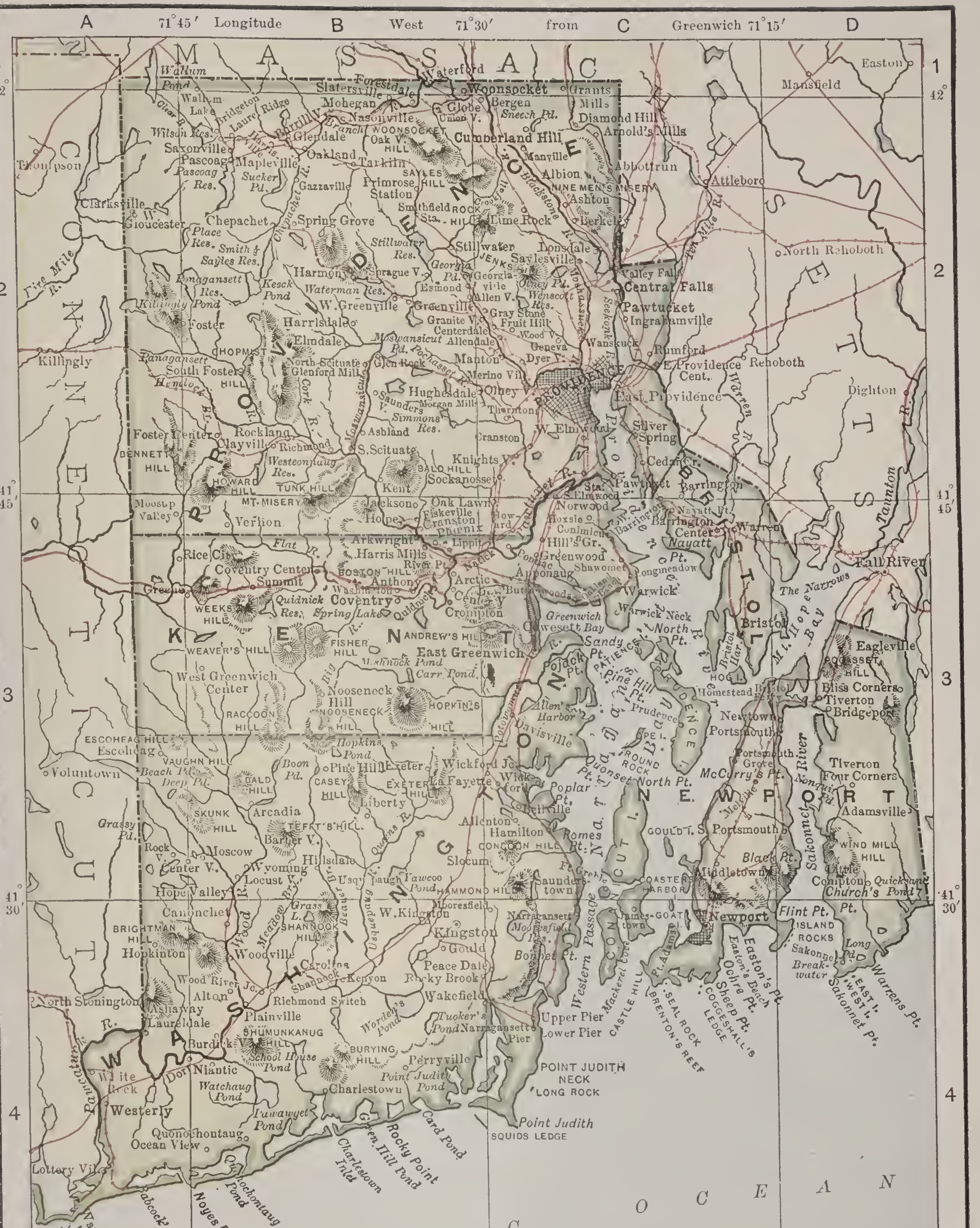
Fisheries. Rhode Island ranked twelfth among the States in value of fishery products in 1908. There were employed in this industry 1404 men, and equipment in use was valued at $877,000. The total investment was $1,504,000. The catch of oysters, the most important of the fishery products, was valued at $969,500. Next in importance are scup, with a catch valued at $158,000, and lobsters, $152,000. Some of the other most important products of the fisheries with their value are: squeteague, $72,000; flatfish and flounders, $50,000; menhaden, $48,000; hard clams, $39,000; soft clams, $38,000; cod, $42,000; butterfish, $42,000. The total value of fishery products was $1,752,000.

Manufactures. The smallest State in the Union and thirty-eighth in population, Rhode Island ranked fourteenth in the value of manufactured products in 1909. With about 96 per cent of its population urban in character, the State is essentially a manufacturing community. In 1909 the per capita value of manufactured products was $517. The table on page 773 shows the most important figures for the 10 leading industries as judged by value of products in the year 1909.

The manufacture of textiles is by far the most important industry. Combined, the four branches of this industry employed 57,169 wage earners in 1909. The value of their products was $133,363,000, representing about 48 per cent of the State's total value of manufactured products. The most important branch of the textile industry is the manufacture of woolen and worsted goods, in the production of which Rhode Island ranked third among the States. In 1909 the number of producing spindles was 459,127 and of looms 9252. The quantity of woolen goods woven was 53,661,591 square yards in that year. The cost of materials in 1909 was $51,025,376. Rhode Island ranked fourth among the States in the production of cotton goods. The cotton industry, which ranks second, dates back to 1790, when the first mill in the United States was started at Pawtucket. The number of producing spindles employed in the manufacture of cotton in 1909 was 2,363,689 and the looms used, 81,093. The value of the material consumed was $25,401,239. In the manufacture of jewelry the State ranked second in 1909.

Of the wage earners engaged in industry in 1909, 74,549 were male and 38,989 were female. Wage earners under 16 years of age numbered 4625. The prevailing hours of labor ranged from 54 to 60 a week for the large majority of wage earners.

Providence, the only place with more than 100,000 inhabitants, is the most important manufacturing city. The number of wage earners employed in 1909 was 46,381 and the total value of products for 1080 establishments was $120,241,000. The manufacture of woolen and worsted goods is the most important industry, of which the value of products was $29,926,448 in 1909. The manufacture of jewelry and allied industries in the State is almost entirely confined to this city. This ranks second among the industries of the city in value of products. Pawtucket ranks second to Providence in the value of its manufactured products. This in 1909 was $37,696,186 for 217 establishments. The most important industry here is textile manufactures. The value of products of the cotton mills in 1909 was $14,337,874. Foundry and machine-shop products ranked second in importance. Woonsocket and War-



RHODE ISLAND

wick followed Pawtucket in industrial importance. The woolen mills in the former contributed 70.5 per cent and the cotton mills of the latter 77.8 per cent of the total value of products of the respective cities. See also under the individual titles.

SUMMARY OF MANUFACTURES FOR 1909 AND 1904

THE STATE — TEN LEADING INDUSTRIES

INDUSTRY	Census	Number of establishments	PERSONS ENGAGED IN INDUSTRY		Capital	Wages	Value of products	Value added by manufacture
			Total	Wage earners (average number)	Expressed in thousands			
All industries	1909	1,951	122,641	113,538	$290,901	$55,234	$280,344	$122,152
	1904	1,617	104,299	97,318	215,901	43,113	202,110	89,238
Bread and other bakery products	1909	187	1,401	1,055	1,436	659	3,937	1,466
	1904	174	1,228	964	1,056	570	3,054	1,230
Cotton goods, including cotton small wares.	1909	106	29,488	28,786	67,679	11,797	50,313	24,912
	1904	99	25,425	24,758	47,477	8,890	34,573	14,907
Electrical machinery, apparatus, and supplies.	1909	12	1,730	1,601	4,315	678	6,410	1,815
	1904	11	1,531	1,409	3,608	557	5,435	1,418
Foundry and machine-shop products.	1909	141	11,905	10,937	27,011	6,900	20,612	12,598
	1904	143	9,498	8,617	23,883	4,676	14,194	9,180
Gold and silver, reducing and refining, not from the ore.	1909	15	142	82	711	57	4,442	271
	1904	10	120	77	599	55	4,261	274
Hosiery and knit goods	1909	17	1,849	1,774	2,878	635	3,866	1,422
	1904	15	1,802	1,721	2,277	574	3,345	1,074
Jewelry	1909	296	11,002	9,511	17,050	4,761	20,685	10,897
	1904	197	7,507	6,475	11,199	3,365	14,432	7,774
Silk and silk goods, including throwsters.	1909	13	1,750	1,685	3,496	788	4,584	1,396
	1904	8	1,326	1,291	2,652	480	2,556	860
Silverware and plated ware	1909	11	2,517	2,294	9,422	1,568	6,198	3,563
	1904	10	2,067	1,919	8,582	1,440	5,323	2,900
Woolen, worsted, and felt goods, and wool hats.	1909	88	25,673	24,924	68,867	11,538	74,600	23,575
	1904	82	22,090	21,610	45,600	9,102	52,641	16,705

Transportation. The only river large enough to bear commercial transportation is the Providence River, which is navigable to Providence. The harbor is shallow, and while a good deal of coastwise trade is carried on from here and from other ports on Narragansett Bay, there is little accommodation for large ships engaged in foreign commerce. The main outlet for Rhode Island's manufactures is the New York, New Haven, and Hartford Railroad, which operated a total of 457 miles of all tracks in 1914.

Banks. The first bank of Rhode Island was the Providence Bank, founded in 1791. The name of this institution was changed in 1865 to the Providence National Bank, under which name it is still doing business. The early banking history of the State, however, centres about the Providence Institution for Savings, which is the largest savings bank in Rhode Island. The date of its charter is 1819, but is antedated by that of the Savings Bank of Newport by three or four months. The following statistics on the banks are for 1915 from the report of the State Banking Commissioner.

ITEM	National banks	Trust companies	Savings	State
Number	18	13	15	3
Capital	$6,070,000	$8,047,000	....	$520,000
Surplus	4,561,000	7,018,000	$2,271,000	218,000
Cash, etc.	2,174,000	6,332,000	785,083	317,820
Loans	29,659,000	67,313,000	33,507,924	2,594,429
Deposits	30,136,000	114,881,000	83,478,000	2,956,662

Government. The present constitution was adopted in 1842 and has been amended in several important details since that date. Amendments may be proposed by a majority of the members of both Houses of the General Assembly, and must be approved by a majority of the members of two consecutive Legislatures and by three-fifths of the electors voting, before becoming part of the constitution. The seat of the government is Providence.

Executive.—The chief executive is the Governor. Other officers are the Lieutenant Governor, Secretary of State, Attorney-General, and General Treasurer. These are all elected at town and district meetings every two years. Prior to 1912 elections for State officials were annual. The Governor has power to convene the General Assembly in any town or city in the State at any time not provided for by law. The Governor has the power of veto, which was granted to him by a constitutional amendment adopted in 1909.

Legislative.—The legislative power is vested in two Houses, the Senate and the House of Representatives. Both together are called the General Assembly. The House of Representatives must never exceed 100 members and is constituted on the basis of population. Every town and city is entitled to at least one member, but no town or city must have more than one-fourth of the whole number of members. Prior to 1909 the limit of membership was 72. The Senate consists of the Lieutenant Governor and of one Senator from every town and city in the State. By an amendment passed in 1909 the Lieutenant Governor was made the presiding officer in the Senate and in grand committee.

Judiciary.—The judicial power is vested in a supreme court and subordinate courts. The supreme court is composed of five judges, of whom one is the Chief Justice, elected by members of the two Houses in grand committee. The supreme court has final revisory and appellate jurisdiction in all questions of law and equity. The superior court was created by an act of the General Assembly and consists of a Chief Justice and six associates. The State is divided into 12 judicial districts, each of which is presided over by a justice of the district court. The city of Providence has a special police court.

Suffrage and Elections.—Every male citizen of the United States, of the age of 21, who has resided in the State for two years, and in the town or city in which he offers to vote for six months, preceding the time for his voting and whose name has been registered before the last day of June in the year next preceding the date of voting, has the right to vote. No person, however, may at any time vote in the election of the city council of any city, or for any proposition to impose a tax, or for the expenditure of money in any town or city, unless he shall within the year next preceding have paid a tax assessed upon his property which must be valued at at least $134. Every adult male is also obliged to pay a poll tax of $1, which is applied to the support of the public schools. The general State election is held on the Tuesday following the first Monday in November biennially, dating from 1912. There is no system of primary elections for the nomination of officers. State officials are nominated at State conventions, to which the delegates are elected at party caucuses. Towns are governed by town meetings.

Miscellaneous and Statutory Provisions.—The hours of labor for women and children in manufacturing and mechanical establishments are limited to 54 in any one week. In 1912 there were created a public-utilities commission, a board of tax commissioners, and a board of control and supply. The State is under license.

Finances. The paper-money system, which was prevalent throughout all the Colonies, kept Rhode Island's finances in a continual state of disorder. The Revolution left the State with a large debt and heavy taxes, and this condition of affairs was not remedied until Rhode Island joined the Union. In 1789 the Revolutionary debt was repudiated by the passage of the compulsory-tender act compelling creditors to accept paper money at an arbitrary rate. On Jan. 1, 1914, the balance on hand in the treasury amounted to $15,758.34. The total receipts during the year were $3,142,243.04 and the expenditures $3,095,584.26. There was a balance on hand of $2,417.12 on Jan. 1, 1915. The total bonded debt was $6,917,000. From this sum, however, there should be deducted a sinking fund of $844,955.50.

Militia. In 1910 the number of males of militia age (18 to 44 years) was 125,313. The organized militia in 1914 consisted of 3 troops of cavalry, 1 battery of field artillery, and 17 companies of coast artillery. The number of men was 1303 enlisted and 96 commissioned.

Population. The population of Rhode Island at various periods (estimated before 1748) was: 1658, 1200; 1675, 3000; 1689, 5000; 1730, 17,935; 1748, 32,773; 1774, 59,707; 1782, 52,391; 1800, 69,122; 1820, 83,059; 1840, 108,830; 1860, 174,620; 1880, 276,531; 1890, 345,508; 1900, 428,556; 1910, 542,610; 1915 (State census), 595,986. In 1910 the State ranked thirty-eighth in the Union in population and first in density, 508.5 persons per square mile. The inhabitants are essentially urban in character, 524,654 living in places of 2500 or over in 1910. By sex the population was divided into 270,314 males and 272,296 females. The native-born whites numbered 363,469, of whom 96,353 were born in other States. Of those born in other States 11.1 per cent came from Massachusetts, 3.8 per cent from Connecticut, and 3.4 per cent from New York. The number of foreign-born whites in 1910 was 178,025, to which Canada contributed 41,894, or 23.5 per cent; Ireland, 29,715, or 16.7 per cent; England, 15.6 per cent; Italy, 15.3 per cent. There were 9529 negroes, 284 Indians, and 272 Chinese. The males of voting age numbered 163,834 in 1910. There were nine cities in 1910 with over 10,000 inhabitants. These with their population in 1910 and 1915 (State census) are: Providence, 224,326 and 247,660; Pawtucket, 51,622 and 55,335; Woonsocket, 38,125 and 40,075; Newport, 27,149 and 30,472; Warwick, 26,629 and 29,084; Central Falls, 22,754 and 23,708; Cranston, 21,107 and 26,940; East Providence, 15,808 and 18,584; Cumberland, 10,107 and 9929.

Education. The State has an effective educational system, well administered. The presence of a large body of foreign population adds a difficulty to the educational problems and also increases the percentage of illiteracy, which in 1910 was 7.7 per cent of the total population, a higher percentage than is found in any other of the New England States. The total number of illiterates in that year was 33,854, and of these 29,781 were foreign-born whites. The percentage among native whites was 0.7. The total school population in 1910 (6 to 20 years) was 148,102; of these 90,328, or 61 per cent, attended school in that year. The school population in 1915 (ages 5 to 15 years inclusive) was given by the commissioner of public schools as 110,198. The total enrollment in the school year 1913–14 was 86,505. There were 2586 teachers, of whom 2369 were women and 217 were men. The total expenditures for public schools in 1913–14 was $2,868,854. The Legislature of 1914 passed a law requiring a minimum school term of 36 weeks. The General Assembly in 1913 enacted a law designed to encourage industrial instruction and providing State aid. There is an excellent system of high and secondary schools. The high schools in 1914 numbered 22. Towns are entitled to receive State aid for the support of high schools provided the courses of education are approved by the State Board of Education and provided also that pupils of other towns are admitted to the extent of the capacity of the schools at a rate of tuition not to exceed the average cost per capita of maintaining the schools. Every town is required by law to provide high-school education for its youth. Provision has been made for the supervision of public schools, and in 1908 measures were passed by the Legislature insuring a proper standard of school supervision. In 1915, 23 professional superintendents were in service. There is a normal school in Providence which maintains more than 30 training schools or stations in different parts of the State. Special schools are the Rhode Island School of Design, at Providence; Rhode Island School for the Feeble-Minded, at Exeter; the Rhode Island Institute for the Deaf, at Providence; and the State Home and School for Children, in Providence. Institutions for higher education are the Rhode Island State College, at Kingston, a State institution, and Brown University, at Providence.

Charities and Corrections. A State board of charities and corrections has control of the State institutions. These are situated upon what is known as the State Farm in the city of Cranston, and comprise the State Hospital for the Insane, the State Almshouse, the State Workhouse and House of Correction, the State Prison and Providence County Jail, the Sockanosset School for Boys, and the Oaklawn School for Girls. The two latter institutions are departments of the State Reform School. The total number of inmates in these several institutions on Jan. 1, 1915, was 3160. Other charitable institutions are the Rhode Island Soldiers' Home, at Bristol; the Butler Hospital, at Providence; and the State Sanatorium for Consumptives, at Wallum Lake.

Religion. The number of communicants of the Roman Catholic church in 1908 was 178,160, about one-fourth of the population of the State. Among the Protestant bodies the Baptists are the strongest, consisting of about one-third of the total Protestant strength. The Protestant Episcopalians rank third.

History. The stories of Norse exploration within the present limits of the State rest upon slight foundation. True history begins when Roger Williams (q.v.) was banished from Massachusetts Bay and settled with a few companions at Providence Plantations, on land purchased from the Narraganset Indians, probably in June, 1636. Already, however, William Blackstone, who had fled from the tyranny of the lords brethren in Massachusetts, as he had left England to escape the lords bishops, had settled near Pawtucket River. In March, 1638, a band of Antinomians banished from Massachusetts Bay, under the leadership of William Coddington and John Clarke, and including William and Anne Hutchinson (q.v.), made a settlement at Pocasset (Portsmouth), on Aquidneck Island (Rhode Island). The next year a secession from this settlement founded Newport, but in 1640 these two towns were united under William Coddington as Governor. In 1643 Samuel Gorton (q.v.) founded Warwick upon the mainland. At Providence the government was at first a pure democracy, "ignoring any power in the body politic to interfere with those matters which alone concern man and his Maker." Each of these settlements was at first independent. In 1642 it was determined to seek a patent from England, and the next year Roger Williams went to England for this purpose. Through the influence of the Earl of Warwick Parliament granted (1644) a charter uniting the settlements as the Incorporation of Providence Plantations in the Narragansett Bay in New England.

The towns at first, from jealousy and exaggerated ideas of individual importance, refused to enter into the confederation, but finally, through fear of revolutions within and of Massachusetts without, the union was formed in 1647. This jealousy lasted well into the nineteenth century and explains much of the peculiar conduct of the Colony and of the State. Complete religious toleration was granted together with the largest measure of political freedom. William Coddington, while President, sought to bring the Island into relations with the United Colonies of New England. In 1650 he went to England, and in 1651 obtained a grant of the islands within the Colony. Williams was able to have this grant vacated in 1652, but not until 1654 were the settlements again united. In 1663 the charter of Rhode Island and Providence Plantations was obtained, and this served as a constitution until 1842. During the war waged on charters by James II the charter of Rhode Island was abrogated by Sir Edmund Andros (q.v.), 1686–89, but on his deposition the old government was quietly renewed under it, though a property qualification for suffrage was added in 1724.

Relations with the other New England Colonies were unpleasant. The Colony suffered severely in the war with King Philip (q.v.), though opposed to the policy which caused it. Connecticut and Massachusetts claimed practically all of the territory included in the charter limits. The Connecticut boundary, after much wrangling, was finally settled in 1727, and the Massachusetts boundary was confirmed in 1746–47, but was not finally settled until 1861. Both of these Colonies looked on Rhode Island as a nest of heretics and a refuge for the disaffected. The Colony was shut out from the United Colonies of New England and in every way made to feel her slight influence. Nevertheless the growth of the Colony in population and wealth was steady, and many of the inhabitants turned to the sea for a livelihood. In the Colonial wars Rhode Island privateers inflicted much damage, and some of her citizens were accused of piracy. In 1775 an army of observation was organized for the defense of the Colony, and two of the 13 ships ordered by Congress were built here. Rhode Island renounced allegiance to Great Britain on May 4, 1776, and united with the other Colonies for defense. During the Revolution Newport was held (1776–79) by British troops, and in 1780 the French fleet was stationed there. The famous soldier of Rhode Island was General Nathanael Greene (q.v.). After the Revolution the State blocked every attempt to give increased power to Congress. This was partly due to the prevalent exaggerated individualism and partly to the desire to retain the right to levy import duties and to force her paper money into circulation. Much paper money had been issued early in the century and in 1786 another era of inflation began. The paper issued on land mortgages depreciated, but many attempts were made to make it a legal tender. A debtor might deposit with a judge of the court the sum owed and upon notice to the creditor the debt was legally satisfied. The notices began, "Know ye," and hence the epithet applied in derision to residents of the State. The country or paper-money party was in complete control, and a test act requiring all to regard the paper as equal to specie was passed.

The State refused to send delegates to the convention which drew up the Federal Constitution, and when that instrument was submitted for approval it was overwhelmingly rejected by the town meetings. Many attempts to call a convention to consider the Constitution failed, and it was not until threats of coercion had been made that the instrument was ratified (May 29, 1790). Though the commercial and manufacturing interests of the State grew rapidly, the power still lay in the country districts, as the basis of representation had not been changed since the granting of the charter, except to admit new towns. Dissatisfaction finally culminated in Dorr's Rebellion in 1841. (See DORR, THOMAS WILSON.) A new State constitution was adopted as a result in 1842, which has been frequently amended since. The property qualification for suffrage was not abolished until 1888, and election by a plurality has been allowed since 1893. Until 1900 the Legislature met in Newport in April to canvass the vote and adjourned to Providence in January to transact business. Now all sessions are held in Providence. A prohibitory amendment to the constitution was adopted in 1886, but was repealed in 1889.

The Democrats in 1907 elected James H. Higgins Governor. During this entire year the State had only one Representative in the United States Senate, owing to the failure of the Legislature to agree upon a candidate. The Legislature on Jan. 21, 1908, finally reëlected George P. Wetmore, Republican, United States Senator. The Republicans in this year were successful in electing their candidate, Aram J. Pothier, Governor. In the national election, November 3, the vote was as follows: Taft, 43,942; Bryan, 24,706. For Governor Pothier received 36,776 votes, compared with 31,406 for his Democratic opponent. The Republicans were again successful in 1909, reëlecting Governor Pothier. Three important constitutional amendments were adopted in the same year. One of these provided for redistricting the State so that the House of Representatives should have 100 members instead of 72. Another provided that the Lieutenant Governor shall preside over the Senate, and the third gave to the Governor the veto power, which he had not had hitherto. In 1910 Governor Pothier was reëlected for a third term. Charles R. Brayton, for many years the chief political power in the State and practically the dictator in matters of Republican politics, died on September 22 of this year. On Jan. 18, 1911, the Legislature elected Henry F. Lippitt, Republican, to succeed Senator Nelson W. Aldrich (q.v.). Governor Pothier was reëlected for a fourth term. A constitutional amendment providing for biennial elections was approved in this year. In the national election of Nov. 5, 1912, Wilson received 30,412 votes; Taft, 27,703; and Roosevelt, 16,878. A Republican Legislature was elected, and this body on Jan. 21, 1913, elected LeBaron B. Colt United States Senator to succeed George P. Wetmore, whose term had expired. In the State election of 1914 the Republicans elected their candidate for Governor, R. L. Beeckman.

In national politics the State has been erratic. From 1792 to 1800 she gave her vote to the Federalist electors, but in 1804 was Democratic. In 1808 and 1812 the Federalists again secured control, but in 1816 and 1820 the State was once more Democratic. Rhode Island supported the tariff wing of the Democracy in 1824, but in 1828 was National Republican (the name originally borne by the Whig party) and in 1832 Whig, only to be Democratic again in 1836. From 1840 to 1848 the Whig candidates received her votes, and in 1852 the State went back to Democracy. From 1856 to 1908 the State was Republican in national elections.

GOVERNORS

Providence had no chief executive from its organization until the union under the patent in 1647.

PORTSMOUTH (POCASSET)

William Coddington	Judge	1638–39
William Hutchinson	“	1639–40

NEWPORT

William Coddington	Judge	1639–40

PORTSMOUTH AND NEWPORT

William Coddington	Governor	1640–47

PRESIDENTS OF COLONY UNDER PATENT

John Coggeshall	1647–48
Jeremy Clarke	1648–49
John Smith	1649–50
Nicholas Easton	1650–51

THE DIVISION 1651–54

PROVIDENCE AND WARWICK

Samuel Gorton	President	1651–52
John Smith	“	1652–53
Gregory Dexter	“	1653–54

AQUIDNECK (PORTSMOUTH AND NEWPORT)

John Sanford	President	1653–54

THE REUNION PRESIDENTS

Nicholas Easton	1654
Roger Williams	1654–57
Benedict Arnold	1657–60
William Brenton	1660–62
Benedict Arnold	1662–63

UNDER THE ROYAL CHARTER

Benedict Arnold	1663–66
William Brenton	1666–69
Benedict Arnold	1669–72
Nicholas Easton	1672–74
William Coddington	1674–76
Walter Clarke	1676–77
Benedict Arnold	1677–78
William Coddington	1678
John Cranston	1678–80
Peleg Sanford	1680–83
William Coddington, Jr.	1683–85
Henry Bull	1685–86
Walter Clarke	1686
Charter suspended by Governor Andros	1686–89
Henry Bull	1690
John Easton	1690–95
Caleb Carr	1695
Walter Clarke	1696–98
Samuel Cranston	1698–1727
Joseph Jencks	1727–32
William Wanton	1732–33
John Wanton	1733–40
Richard Ward	1740–43
William Greene	1743–45
Gideon Wanton	1745–46
William Greene	1746–47
Gideon Wanton	1747–48
William Greene	1748–55
Stephen Hopkins	1755–57
William Greene	1757–58
Stephen Hopkins	1758–62
Samuel Ward	1762–63
Stephen Hopkins	1763–65
Samuel Ward	1765–67
Stephen Hopkins	1767–68
Josias Lyndon	1768–69
Joseph Wanton	1769–75

STATE GOVERNORS UNDER THE CHARTER

Nicholas Cooke		1775–78
William Greene, Jr.		1778–86
John Collins		1786–90
Arthur Fenner	Federalist-Republican	1790–1805
Paul Mumford (acting)	“	1805
Henry Smith “	“	1805–06
Isaac Wilbour “	“	1806–07
James Fenner	“	1807–11
William Jones	“	1811–17
Nehemiah R. Knight	Democratic-Republican	1817–21
William C. Gibbs	“	1821–24
James Fenner	Whig	1824–31
Lemuel H. Arnold	“	1831–33
John B. Francis	“	1833–38
William Sprague	“	1838–39
Samuel W. King	“	1839–43

GOVERNORS UNDER THE CONSTITUTION

James Fenner	Whig	1843–45
Charles Jackson	“	1845–46
Byron Diman	“	1846–47
Elisha Harris	“	1847–49
Henry B. Anthony	“	1849–51
Philip Allen	Democratic-Free Soil	1851–53
Francis M. Dimond (acting)		1853–54
William W. Hoppin	American	1854–57
Elisha Dyer	Republican	1857–59
Thomas G. Turner	“	1859–60
William Sprague	“	1860–63
William C. Cozzens	“	1863
James Y. Smith	“	1863–66
Ambrose E. Burnside	“	1866–69

GOVERNORS UNDER THE CONSTITUTION — *Cont.*

Seth Padelford	Republican	1869–73
Henry Howard	"	1873–75
Henry Lippitt	"	1875–77
Charles C. Van Zandt	"	1877–80
Alfred H. Littlefield	"	1880–83
Augustus O. Bourn	"	1883–85
George P. Wetmore	"	1885–87
John W. Davis	Democrat	1887–88
Royal C. Taft	Republican	1888–89
Herbert W. Ladd	"	1889–90
John W. Davis	Democrat	1890–91
Herbert W. Ladd	Republican	1891–92
D. Russell Brown	"	1892–95
Charles W. Lippitt	"	1895–97
Elisha Dyer	"	1897–1900
William Gregory	"	1900–01
Charles Dean Kimball	"	1901–03
Lucius F. C. Garvin	Democrat	1903–05
George H. Utter	Republican	1905–07
James H. Higgins	Democrat	1907–09
Aram J. Pothier	Republican	1909–15
R. Livingston Beeckman	"	1915–

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RHODES (Lat. *Rhodus*, from Gk. Ῥόδος). An island of Asiatic Turkey, off the southwest coast of Asia Minor (Map: Greece, Ancient, F 3). It is 49 miles long and 21 miles in greatest breadth, and is traversed in the direction of its length—from northeast to southwest—by mountains which reach in Mount Ataÿros (the ancient Atabyrion) a height of 4070 feet. Its area is 564 square miles. Its population in 1909, according to Baedeker, was 46,500, of whom three-fourths were Greeks. The island is governed by a Turkish pasha, but is neglected and shows few traces of its ancient prosperity. Its climate is temperate, and its valleys are fertile, producing grain, oil, oranges, citrons, etc.

Rhodes rose into importance early. Ialysus was a place of trade during the second millennium B.C., for Mycenæan (late Minoan) vases have been found in its necropolis. When the island first appears in history, it is peopled by Dorians who dwell in three cities—Lindus, near the centre of the east coast, with a good harbor, and still a town; Camirus, on the west coast; and Ialysus, also on the west coast, near the northern end of the island. These cities, with Calymna, Cos, and Halicarnassus, formed the Doric Hexapolis, which later, by the expulsion or withdrawal of Halicarnassus, became a Pentapolis. During the seventh and sixth centuries B.C. the island shared in the commercial prosperity of the Greek states of Asia Minor. Archæological discoveries on the island prove extensive trade with Phœnicia (q.v.). A colony was planted at Phaselis on the east coast of Lycia, and, alone of the Asiatic Greeks, the Rhodians took part in the first colonizing of Sicily, where they settled Gela, according to the tradition, about 690 B.C. A hundred years later, after an unsuccessful attempt at Lilybæum, another band settled the Lipari Islands. Secure from attack by land, and on friendly terms with the unaggressive naval powers of Phœnicia and Egypt, the island maintained its independence till the Persian conquest and did not finally yield till after the Ionian revolt (500 B.C.). The Rhodians served with Xerxes, though their contingent was small. After the Greek victories they joined the Delian League. (See DELOS.) They revolted from Athens in 411 B.C., and in 408 the three cities combined to found a new capital of the island. This city, Rhodes (q.v.), laid out by Hippodamus of Miletus (q.v.), henceforth represents the island. Excavations were begun on the Acropolis of Lindus in 1902 by Danish scholars, and in the first season the Propylæa and ancient Temple of Athena were discovered. Later the walls of the Acropolis were traced, a fine propylæa and staircase to the Acropolis, like those at Athens, remains of other temples and of a theatre, and many important inscriptions were found. Consult Blinkenberg-Kinch, *Exploration archéologique de Rhodes* (Copenhagen, 1904–07); K. Baedeker, *Konstantinopel, Balkanstaaten, Kleinasien, Archipel, Cypern*, 439–441 (2d ed., Leipzig, 1914).

RHODES. The capital of the island of Rhodes, at its northern extremity, with harbors on the east side (Map: Greece, Ancient, F 3). Its Acropolis was on a hill which rises abruptly from the west coast. The modern city, called Kastro, has a picturesque appearance from the sea as it rises gradually from the two harbors, now choked with sand. In ancient times the main harbor was fortified and could be closed. The present fortifications include only about one-fourth of the ancient city and date largely from the fifteenth century. The place has preserved its mediæval aspect, and there are many traces on the stone houses of its occupation by the Knights of St. John, besides the great castle, the hospital, and especially the straight and picturesque Knights' Road, lined with ancient buildings bearing coats of arms. (See SAINT JOHN OF JERUSALEM, KNIGHTS OF.) The earthquakes of 1851, 1856, and 1863 wrought great destruction in the town. By the powder explosion of 1856 the church of St. John, built in 1500, and the Grand Masters' palace were badly damaged, and the two edifices were destroyed by the earthquake of 1863. Pop., about 12,000.

Rhodes was founded in 408 B.C. and was girt by strong walls, surmounted by towers and provided with two excellent harbors. It soon attained wealth and an important commercial position. In the early years of the fourth century its history was marked by struggles between democracy and aristocracy, leading to interventions by Sparta (412–395, 391–378) and Athens (395–391, 378–357). Rhodes joined the second Athenian League, but in 356 B.C., with Byzantium, Chios, and Cos, withdrew, thus bringing about the Social War, which ended in

Athens conceding the independence of the allies. Rhodes, however, soon fell under the control of Mausolus of Caria (see MAUSOLEUM; ARTEMISIA, 2), but again became free, though in 332 B.C. it voluntarily acknowledged the sway of Alexander. This King greatly favored the city, whose trade rapidly increased, though it was occupied by a Macedonian garrison. On the death of Alexander (323 B.C.) the Rhodians rose and expelled the intruders. The third and second centuries B.C. were the acme of Rhodian prosperity. (See RHODES, LAW OF.) Art flourished; the city was filled with statues, and the famous Colossus (q.v.) was set up at the mouth of the harbor. A later school of art produced the Laocoön (q.v.). In the wars of the period the Rhodians seem to have sought to hold aloof unless their trading interests were threatened. Like the kings of Pergamum, they appealed to Rome as a better ally than their powerful neighbors and joined in the war against Philip V of Macedon and Antiochus III. Later, they endeavored to check the Roman advance against Perseus, and the Roman Senate punished them by making Delos (q.v.) a free port, with damaging effect on the Rhodian trade. After the death of Cæsar, whose side the Rhodians had taken against Pompeius in the civil war, they were defeated in a naval engagement by Cassius, who in 42 B.C. entered the city by force, massacred the hostile leaders, seized the public property, and rifled the temples. This visitation broke the power of Rhodes, but it long continued to maintain its prestige as a seat of learning. Even under the Roman Empire Rhodes maintained a nominal independence and was not attached to any province, except for brief periods, when in disgrace with the reigning Emperor. In the reorganization of the Empire by Diocletian, however, Rhodes became the centre of the Province of the Islands. It was afterward attached to the Byzantine Empire and shared its fortunes till in 1309 it was occupied by the Knights of St. John of Jerusalem, who for over 200 years maintained themselves against the Turks and even gained some foothold on the mainland. They withstood several sieges, notably one in 1480, but were attacked again in 1522 by Sultan Solyman the Magnificent and after the most heroic resistance finally found their position untenable and were forced to abandon the island.

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RHODES, ANDRONICUS OF. See ANDRONICUS OF RHODES.

RHODES, CECIL JOHN (1853-1902). A South African statesman and financier, born at the vicarage of Bishop Stortford, Hertfordshire, England, July 5, 1853. In 1870 his name was entered at Oriel College, Oxford, but an affection of the lungs compelled him in the same year to sail for Natal, whence in 1871 he made his way to the diamond fields at Kimberley. He speedily acquired a large fortune and, with his health restored, returned to matriculate at Oxford in 1873. His health soon failed again, and in March, 1874, he was back in Kimberley on the advice of a physician. But from 1876 to 1881 he spent one-half of the year at Oxford and at the end of that time took his B.A. and M.A. Shrewd in the advancement of his own interests and not entirely unaffected by the loose ethics of the mining camp, he was possessed at the same time of a profound conviction of the virtues of the British Imperial system, and he made it his life plan to extend the sway of the British Empire over South Africa. In 1881 he entered the Cape Parliament; there he directed his efforts towards the establishment of cordial relations between the English and the Dutch in the Colony, and was instrumental in bringing about the annexation of Bechuanaland in 1884. This was a forward step in the extension of British supremacy in South Africa and brought the young statesman into conflict with the Boer Republic of the Transvaal, whose policy was guided by the ambitious and astute "Oom Paul" Kruger, Rhodes's one formidable rival to the end. In 1888 Rhodes obtained from Lobengula, King of the Matabele, the cession of the immense region north of the Limpopo, which speedily came to be known as Rhodesia (q.v.), and in October, 1889, the British South Africa Company was incorporated, with almost full rights of sovereignty over that territory. Rhodes was in fact the sole manager of the company's affairs, and he devoted to the development of the country the resources of the De Beers Consolidated Mines, a corporation controlling the entire diamond industry at Kimberley, organized by Rhodes in 1888.

In 1890 Rhodes became Premier of Cape Colony, retaining at the same time his post as managing director of Rhodesia. He effected much salutary legislation within the Colony; first definitely entered upon the scheme of a British Cape-to-Cairo railway; found time to crush a formidable insurrection of the Matabeles in 1893; yet found time, too, to play an unscrupulous game of politics in the Transvaal, where the discontent prevailing among the foreign inhabitants of Johannesburg afforded him the opportunity for plotting the overthrow of the South African Republic. The Jameson raid in December, 1895, coming before his schemes were fully matured, was a crushing blow for Rhodes, who now appeared before the world as the instigator of a piratical attempt on the government of a friendly nation. (See TRANSVAAL; JAMESON, LEANDER STARR.) He was forced to resign the premiership of Cape Colony, and for a time his political influence was gone. For the next three years he devoted himself to the affairs of the Chartered Company, suppressed a second insurrection of the Matabeles in 1896-97, and hastened the northward advance of his transcontinental railway and telegraph lines. In 1898 he reëntered the Cape Parliament and had made some progress towards regaining his predominant position in South African affairs when the Boer War broke out. During the early part of the war he was besieged at Kimberley, where he was attacked by his old illness. He went to Egypt in the early part of 1901, but, failing to find health there, returned in February, 1902, to Cape Colony and died at Muizenberg, near Cape Town, March 26, 1902. He was buried on his estate in the Matoppo Hills, near Buluwayo in Matabeleland.

Rhodes's character was the subject of much diverse criticism. By some he was regarded as preëminently a man of money, actuated entirely by selfish motives, and one who for the attainment of his ends did not scruple to plunge South Africa into war. To those of British inclinations he appeared rather as one of the great builders of empire, a descendant of Clive and Warren Hastings. Rhodes's will, by which he left almost his entire fortune for the purpose of educating the Anglo-Saxon youth to the idea of empire, radically modified previously formed estimates upon his character. See RHODES SCHOLARSHIPS.

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RHODES, COLOSSUS OF. See COLOSSUS.

RHODES, HELEN. See HARDELOT, GUY D'.

RHODES, JAMES FORD (1848–). An American historian, born in Cleveland, Ohio, May 1, 1848. He was educated at New York University, the University of Chicago, and the Collège de France. In 1867 he was Paris correspondent of the Chicago *Times.* To investigate the iron and steel industries he traveled in Germany and England, and after his return to America he conducted similar investigations in the southern part of the United States. Subsequently, with his father, he was engaged in the coal, iron, and steel business in Cleveland until 1885. In this year he was able to retire and to devote himself to writing a *History of the United States from the Compromise of 1850* (7 vols., 1893–1906), a political narrative and analysis of the events growing out of slavery, the Civil War, and Reconstruction. This work is the most authoritative account of the period which it treats. The author's style, if lacking somewhat in literary grace, is not unattractive; and the content of his writing is characterized by great candor, sincerity, and thoroughness. His treatment of men and measures is marked by an eminent degree of fairness. On occasion he does not hesitate to express very positive views, yet it is to be noted that where a matter is controverted he usually presents both sides. In a marked degree the volumes devoted to the causes of the Civil War are scholarly, impartial, and judicial in treatment, and the exhaustive notes and references found therein are indispensable to the student. Although Rhodes is less attracted by the legal and diplomatic aspects of the War and Reconstruction periods, his scientific analysis of the politics of the two eras, particularly of Reconstruction, is unrivaled. In addition, Rhodes published *Historical Essays* (1909) and *Lectures on the American Civil War,* delivered at Oxford in 1913. He was awarded the Loubat prize of the Berlin Academy of Sciences (1901) and the gold medal of the National Institute of Arts and Letters (1910), became corresponding member of the British Academy and a member of the American Academy of Arts and Letters, and in 1899 served as president of the American Historical Association. Oxford and many American universities gave him honorary degrees.

RHODES, KNIGHTS OF. See SAINT JOHN OF JERUSALEM, KNIGHTS OF.

RHODES, LAW OF. A code apparently drawn up by the Rhodians at the time of their great naval power in the third century B.C., though it is known only from references in Roman law. The code was declared binding by Antonius Pius in so far as it did not conflict with Roman law, but its provisions are not known, except that "if cargo is thrown overboard to lighten a ship, all must contribute to make good the loss incurred for the benefit of all," a doctrine still accepted in maritime law. The extant treatise entitled *Ius Navale Rhodiorum* is a group of mediæval forgeries. See CONSOLATO DEL MARE; OLÉRON, LAWS OF.

RHODES GRASS (*Chloris gayana*). A valuable perennial grass, spreading by surface runners, which is believed to have been brought under cultivation by Hon. Cecil Rhodes on his farm in South Africa about 1895. It is a valuable hay grass and also affords good pasture if properly handled. It was introduced into Australia, from which country it was brought to Hawaii in 1904. It is there considered one of the most drought-resistant grasses, and four or five cuttings for hay are annually obtained from it. Rhodes grass was introduced into the United States in 1903 under the name *Chloris virgata,* but it did not attract much attention for several years. It is now considered one of the most valuable grasses for the more southern States. The seed at present mostly comes from Australia.

RHODESIA, rō̍-dē′zhĭ-ȧ *or* -zĭ-ȧ, NORTHERN. A British African protectorate, under the administration of the British South Africa Company. It is the northernmost division of British South Africa (Map: Congo, F 5). Area, about 291,000 square miles. Formerly it was divided into two provinces, North-Western Rhodesia, or Barotseland, and North-Eastern Rhodesia; these were amalgamated by an order in council effective from Aug. 17, 1911. The country is largely an elevated plateau covered with thin forest; much of it is adapted for agriculture and grazing. Maize, cotton, and tobacco are cultivated, and since 1903 the indigenous rubber has been protected. Gold, copper, zinc, and lead are worked, and coal has been discovered. For railway extension, see the following article. The white population, according to the census of 1911, was 1497; the native population (partly estimated), about 875,000. Livingstone, on the Zambezi, is the administrative headquarters; other centres are Fort Jameson, Abercorn, Fife, Broken Hill Mine, and Lealui, principal residence of Lewanika, paramount chief of the Barotse. Consult Gouldsbury and Sheane, *The Great Plateau of Northern Rhodesia* (London, 1911).

RHODESIA, SOUTHERN. A British South African protectorate under the administration of the British South Africa Company (Map: Congo, F 6). It consists of two provinces, Mashonaland (at the east) and Matabeleland, with a total estimated area of 148,575 square miles.

The larger part of the country is an elevated veldt (3000 to 6000 feet), well wooded and studded with granite kopjes. The country is well watered by the tributaries of the Zambezi and the Limpopo and is covered with a luxuriant vegetation. The climate is healthful in the elevated districts, which occupy the larger part of the country, but is malarial and oppressive in the valleys of the Zambezi and the Limpopo. The average maximum and minimum shade temperatures at Salisbury during the year ended June 30, 1912, were 77.5° and 52°; at Buluwayo, 79.3° and 54.4°. The rainfall at the former town was about 21 inches and at the latter about 20 inches. Practically no rain falls from May to September.

The mineral deposits of Southern Rhodesia include gold, coal, copper, silver, iron, antimony, arsenic, and lead. Gold is found principally in the central part of Mashonaland in the valleys of the Umtali and the Imbesi rivers. The gold deposits of Southern Rhodesia show traces of prehistoric workings. During the eight years following the occupation of the country by the South Africa Company in 1890 the gold output was only 6470 ounces, but the yield then increased and up to the end of 1914 amounted to 7,258,055 ounces, valued at £28,862,173. The value of the output in 1914 was £3,580,208. Extensive beds of excellent coal were discovered in 1900 in the Wankie district, near the Zambezi. The output in 1914 was 349,459 tons. Silver produced in 1914 was 150,792 ounces. Copper occurs in the Gwelo, Victoria, and Lomagundi districts; the output in 1914 was 1011 tons. The output of lead in 1914 was 149 tons and of chrome iron ore 48,207 tons. In 1905 diamonds were discovered in the Gwelo district, and, up to the end of 1914, 10,562 carats had been declared.

The soil of Southern Rhodesia is fertile and well adapted for both agriculture and grazing. Considerable tracts are under cultivation, and thoroughbred animals for live-stock improvement are constantly imported. Good crops of European cereals, vegetables, and fruits are raised, and various subtropical plants are successfully cultivated. Kafir corn, maize, and tobacco are produced in considerable quantity, and there has been some success in cotton planting.

The Rhodesian Railway system (including the Beira Railway, 204 miles, in Portuguese East Africa, and the extension in Northern Nigeria) had a total length of 2468 miles in operation at the end of 1914. The "Cape-to-Cairo" line, built north from Buluwayo, was completed to the border of the Belgian Congo in December, 1909. In the Congo the line has been extended to Kambove, which thus has rail communication with Cape Town, 2421 miles distant. Mention must be made of the great bridge, said to be the highest in the world, which carries the railway across the gorge of the Zambezi below the Victoria Falls and which was opened Sept. 12, 1905; it is 650 feet long, 30 feet wide, and about 420 feet above the river. At the end of 1913 the Rhodesian telegraph system comprised 3393 miles of line and 8350 miles of wire, with over 100 offices. At the same date post offices in Southern Rhodesia numbered 98.

The administration of Southern Rhodesia is vested in the British South Africa Company, but there is also a resident Commissioner appointed by the Secretary of State for the Colonies. The Executive Council is composed of not less than three members appointed by the company with the approval of the Secretary of State. The Legislative Council consists of the company's administrator, six nominees of the company approved by the Secretary of State, and 12 members elected by the registered voters. Native affairs are administered by a secretary, who is assisted by a chief native commissioner and 32 district native commissioners, appointed by the secretary.

The white population of Southern Rhodesia at the end of 1914 was estimated at 30,000. The census of May 7, 1911, returned 771,077 inhabitants (406,069 males, 365,008 females), as compared with 503,065 in 1901. In 1911 natives numbered 744,559; whites, 23,606; Asiatics and other colored persons, 2912. The population of Mashonaland included 495,451 natives and 12,631 whites; Matabeleland, 249,108 and 10,975. The chief towns are Salisbury, Hartley, Umtali, Victoria, and Gatooma, in Mashonaland; and Buluwayo, Salukwe, and Gwelo, in Matabeleland. Salisbury, the capital, stands at an altitude of 4880 feet; white population, 3479. Buluwayo (q.v.) is 4469 feet above the sea and 1362 miles from Cape Town.

In the first half of the nineteenth century the territory now known as Southern Rhodesia was held by the Matabeles, who were forced by the Boers to retreat north of the Limpopo. With the discovery of gold in that part of the continent Cecil Rhodes (q.v.) concluded a treaty with Lobengula, under which the latter bound himself not to enter into any agreement with any power without the approval of Great Britain. In 1880 the mining rights over the territory were also secured by Cecil Rhodes for the consideration of a monthly salary of £100 to Lobengula, 1000 rifles, and a large quantity of ammunition. A royal charter was obtained for the British South Africa Company in 1889. An uprising of the Matabeles in 1893 ended in the overthrow of Lobengula. A more serious uprising occurred after the withdrawal of the white police to Bechuanaland in 1896. The rebellion soon spread to Mashonaland, and it was only with the assistance of troops dispatched from Natal and Mafeking that peace was restored in 1897. See ZIMBABWE.

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RHODES SCHOLARSHIPS, THE. A number of stipends established under the will of Cecil John Rhodes (q.v.), who died in 1902, bequeathing a large part of his estate in trust for the purpose of maintaining a certain number of British, American, and German students at Oxford University, in the belief that "a good understanding between England, Germany, and the United States will secure the peace of the world, and that educational relations form the strongest tie." The founder suggested the following basis for awarding these scholarships: (1) proficiency in literary and scholastic attainments, which was to count three-tenths; (2) success in outdoor sports, two-tenths; (3) qualities of manhood, etc., three-tenths; (4) qualities of leadership, two-tenths. Qualifications second and third were to be decided upon by a vote of the fellow students, first and fourth by the masters of the respective schools where candidates prepare. Examinations when conducted are qualifying, not competitive. The number of scholarships to be thus distributed are as follows: South Africa, 24; Australasia, 21; Canada, 6; Atlantic Islands, 6; West Indies, 3; United States, 96; and Germany, 15. The annual value of the Colonial and American scholarships is £300, tenable for three years. The election of American scholars is spread over three years, scholars being elected from 32 States each year, the election taking place in October. The disposal of the German scholarships is at the pleasure of the Emperor.

In the United States the first qualifying examination, based on the Oxford Responsions, or the first Oxford public examination, was held in 1904 and consisted of Latin, Greek, and elementary mathematics. These examinations were held under the auspices of the State committees designated by the trustees for selecting suitable candidates for the scholarships. In California, Maine, Vermont, and Washington appointments are made by the several chartered universities and colleges in rotation. Candidates must be from 20 to 25 years of age and must have attended a recognized institution of higher learning for two years. Scholars must be unmarried and citizens of the United States. The full number to be maintained at any one time is 189. The average age is about two years above that of the ordinary English public-school boy when he enters the university. Consult G. R. Parker, *The Rhodes Scholarships* (London, 1913); L. B. Mitchell, *The Rhodes Scholarships* (Albuquerque, N. Mex., 1914).

RHODIAN WOOD. See LIGNUM RHODIUM.

RHODINOL, rō′dĭ-nōl $(CH_3)_2C{:}CH.CH_2CH_2CH(CH_3)CH_2.CH_2OH$. A compound of carbon, hydrogen, and oxygen belonging to the class of primary alcohols. (See ALCOHOLS.) It is contained in the attar of roses and imparts to it its characteristic odor. Pure rhodinol is a colorless oily liquid that may be distilled without decomposition under reduced pressure. It is used in perfumery. See ATTAR OF ROSES.

RHO′DIUM (Neo-Lat., from Gk. ῥόδιος, roselike, from ῥόδον, *rhodon*, rose). A metallic chemical element, discovered by Wollaston in 1804. It occurs with other members of the platinum group of metals and, alloyed with gold, as "rhodium gold," or rhodite, a mineral found in Mexico. Rhodium and iridium together are separated by adding iron to the mother liquors from which platinum has been extracted. The precipitate thus obtained is put through a complicated process which finally yields the double chloride of rhodium and ammonium from which the metal may be readily obtained.

Rhodium (symbol, Rh; atomic weight, 102.9) is a white, hard, malleable metal that fuses at about the same temperature as platinum and absorbs oxygen like that metal. It combines with oxygen to form a monoxide, a sesquioxide, a dioxide, and probably a trioxide. With platinum it forms a valuable alloy which is used in the thermoelectric pyrometer. This alloy contains about 18 per cent of rhodium. Crucibles made of rhodium may be used for the same purposes for which platinum crucibles are still generally used in laboratories.

RHODIUS, APOLLONIUS. See APOLLONIUS RHODIUS.

RHO′DODEN′DRON (Neo-Lat., from Gk. ῥοδόδενδρον, *oleander*, from ῥόδον, *rhodon*, rose + δένδρον, *dendron*, tree). A genus of about 200 trees and shrubs, including *Azalea* (q.v.), of the family Ericaceæ. The species of *Rhododendron* proper as distinguished from *Azalea* have evergreen leaves, and many of them are of great beauty both in foliage and in flower. They vary in size from a few inches in height to trees 50 to 60 feet high and 18 inches in diameter. A few small species are natives of continental Europe and of Siberia, but the greater number are found in temperate North America and in the mountains of India. *Rhododendron maximum*, so designated when the far larger Indian species were unknown, is a common American ornamental shrub or small tree which forms impenetrable thickets in the Alleghany Mountains and is magnificent when in flower. The flowers are large, in umbellate corymbs, varying in color from pale carmine to white spotted with red or yellow. *Rhododendron ponticum*, a very similar species with narrower and more pointed leaves, of the same color on both sides, is a native of western Asia and apparently also of southern Spain. *Rhododendron catawbiense*, a native of the southern Alleghanies, with large lilac-purple flowers, and *Rhododendron arboreum*, a native of Nepal, with very dense heads of large scarlet flowers and leaves 12 to 18 inches long, attaining a height of 30 to 40 feet in its native country, are fine and well-known species; *Rhododendron californicum* and *Rhododendron macrophyllum* are among the most conspicuous species of the Pacific coast region. Most of the extremely numerous varieties common in gardens and shrubberies have been produced by hybridization. In many if not most of the hybrids *Rhododendron catawbiense* enters, and, in

RHODODENDRON (*Rhododendron ponticum*).

a list published in 1871, 250 named hybrids of this species are mentioned. Since that time the number has undoubtedly greatly increased.

Many splendid species of *Rhododendron* have been discovered in the Himalaya, the Khasia Hills, and other mountainous parts of India, by Hooker and others; and some of them have been introduced into cultivation. An oil obtained from the buds of *Rhododendron ferrugineum* and *Rhododendron hirsutum* has been used by the inhabitants of the Alps under the name *olio di marmotta*, as a remedy for various ailments. The flowers of *Rhododendron arboreum* are said to be eaten in India, and Europeans make a jelly of them. The wood of some of the larger species is white, hard, and close-grained and has been recommended as a possible substitute for boxwood. The species with deciduous leaves that are generally called azaleas are now listed under *Rhododendron*. Rhododendrons are not of difficult culture, a soil containing plenty of leaf mold and protection from drought and winter scalding being the prime necessities for growing the hardier species in shrubberies and parks. See Colored Plate of AZALEAS AND RHODODENDRONS. Consult William Watson, *Rhododendrons and Azaleas* (New York, 1911).

RHO'DOLITE. A purple-red variety of garnet, found in Macon Co., N. C., and used locally for a gem stone.

RHO'DONITE (from Gk. ῥόδον, *rhodon*, rose). A manganese silicate of the pyroxene group with part of the manganese replaced by iron, calcium, or zinc. Rhodonite crystallizes in the triclinic system, has a vitreous lustre, and is usually brownish red, flesh red, or pink, although sometimes green or yellow. It occurs frequently in association with iron and zinc ores and is found in Sweden, the Harz, the Urals, and in the United States at various localities in Massachusetts and in Sussex Co., N. J., where part of the manganese is replaced by zinc, giving rise to a variety known as *fowlerite*. The massive varieties of this mineral, especially those found in the Ekaterinburg district in the Urals, are used for table tops, etc., while varieties from other places are used to a limited extent as gems.

RHO'DOPHY'CEÆ (Neo-Lat. nom. pl., from Gk. ῥόδον, *rhodon*, rose + φῦκος, *phykos*, seaweed). One of the three great groups of algæ, commonly known as red algæ and including the majority of the marine algæ. They are not so bulky as many of the brown algæ (kelps), but they are much more diversified in form. Among the simplest forms the body is a simple or branching filament, or it may be flat and filmy or ribbon-shaped. The more complex forms show an extreme differentiation of the body into branching stems, leaves, and holdfasts. The species of *Corallina* resemble branching coral on account of the abundant deposit of lime in their cell walls. The general hue of the plants is red or violet, sometimes dark purple or reddish brown, the color being due to the presence of a red pigment (phycoerythrin) that may be separated from the green pigment (probably chlorophyll). One of the chief peculiarities of the group is the absence of any ciliated cells, either swimming spores or gametes, which is a surprising feature in so aquatic a group.

Asexual reproduction is chiefly by means of tetraspores, so named because the sporangium produces four spores, which are nonmotile (Fig. 1). The sexual reproduction is very characteristic, the male organs (antheridia) being very simple and the female organs (procarps) often very complex. The antheridia are single cells which either discharge their protoplasts or become detached and float to the female organ.

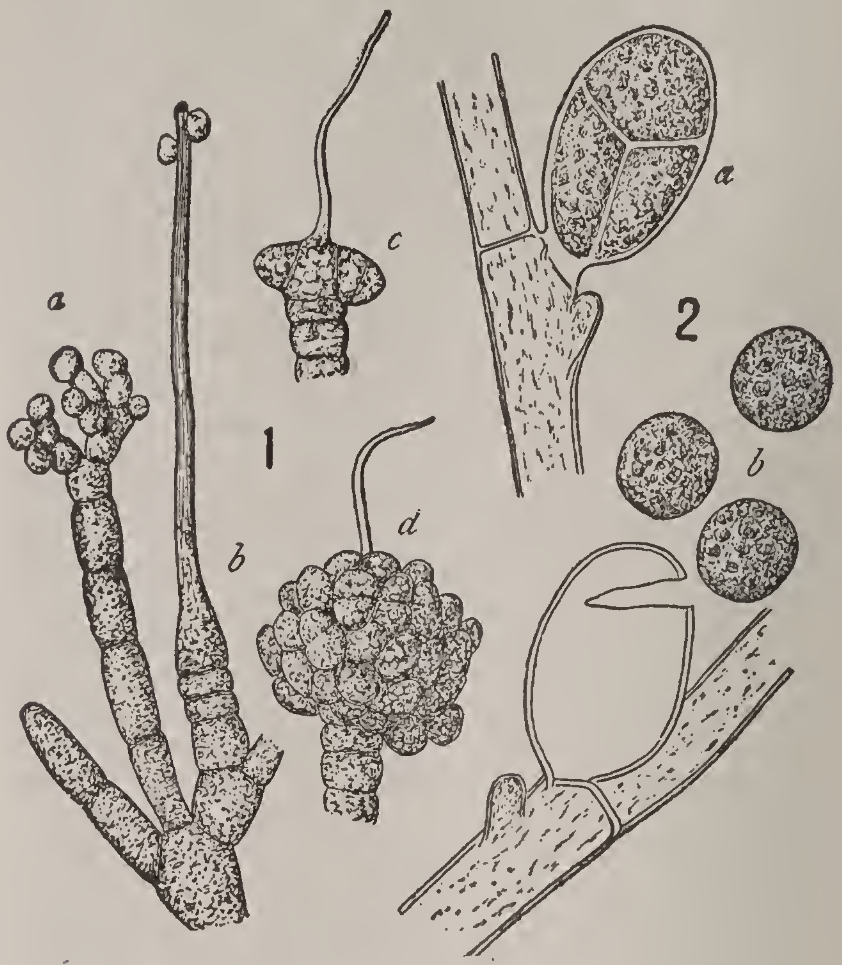

FIG. 1. RED ALGÆ.

1, *Nemalion*, sexual branches, showing antheridia (*a*) and carpogonium (*b*) with trichogyne to which two spermatia are attached, beginning of a crystocarp (*c*), and an almost mature crystocarp (*d*); 2, *Callithamnion*, showing sporangium (*a*) and three discharged tetraspores (*b*).

In either event these detached cells are called spermatia. In the simpler forms the female organs consist of two cells, the carpogonium and the trichogyne, the latter being a hairlike cell with which the spermatia come in contact. In the more complex forms there are also "auxiliary cells" which enter into the structure of the procarp. The spermatium or its contents enter the trichogyne and pass into the carpogonium, where the two nuclei fuse. As a result of this fusion a structure is developed (cystocarp, Figs. 1 and 2) which produces spores (carpospores), which in turn produce plants which bear the tetraspores and sex organs. In some forms a distinct alternation of generations (q.v.) is evident. For example, in *Polysiphonia* (Fig. 2) there are three kinds of individuals, resembling one another in vegetative features; but differing in their reproductive organs; the tetrasporic plant bearing only tetraspores, the male plant bearing only antheridia, and the female plant bearing only procarps.

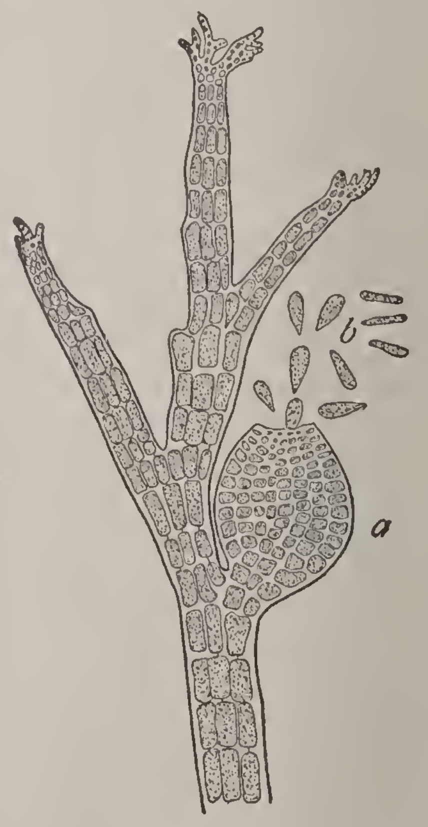

FIG. 2. POLYSIPHONIA.

Showing branching, a cystocarp (*a*), and escaping spores (*b*).

Consult: Engler and Prantl, *Die natürlichen*

Pflanzenfamilien (Leipzig, 1887 et seq.); Murray, *Introduction to the Study of Seaweeds* (London, 1895); Coulter, Barnes, and Cowles, *Textbook of Botany* (New York, 1910).

RHODO'PIS (Lat., from Gk. 'Ροδῶπις). A famous Greek courtesan, a native of Thrace. At one time she was a fellow slave of the poet Æsop. Later she was carried to Naucratis in Egypt. There Charaxus, brother of Sappho, fell in love with her and ransomed her at a great price. (See Herodotus, ii. 134–135.) She was attacked by Sappho in a poem.

RHOM'BOID. See PARALLELOGRAM.

RHOM'BUS. See PARALLELOGRAM.

RHONDDA, rŏnd'dȧ. An important and populous coal-mining district, now a municipality of Glamorganshire, Wales. It is situated amid picturesque valley scenery on the Rhondda River, near Merthyr Tydfil. Pop., 1901, 113,700; 1911, 152,781.

RHONDE, ISLE OF. See GRENADINES.

RHONE, rōn (Fr. *Rhône;* Lat. *Rhodanus*). The principal river of southeastern France. It rises at an altitude of 7550 feet in the Rhone Glacier on the south slope of the Dammastock, a peak of the Urner Alps in south-central Switzerland (Map: France, S., J 3). It flows first in a general southwest course through southern Switzerland and into France as far as Lyons, then due south until it empties into the Gulf of Lyons in the Mediterranean Sea, 25 miles west of Marseilles. Its length is 504 miles. Its upper course is fed by a number of torrents originating in glaciers. It flows through the great valley lying between the Bernese and the Pennine Alps, which forms the Swiss Canton of Valais. At Martigny the valley is narrowed and the river makes a sharp turn to the northwest, becomes then navigable below Saint-Maurice, and enters the eastern end of Lake Geneva after falling 4679 feet in 105.5 miles. Its middle course, Lake Geneva to Lyons, begins as a limpid stream, but soon becomes turbid by the entrance of the Arve. After passing through the Jura Range in a deep and narrow gorge, its width is decreased from 350 to 25 yards. Here it formerly disappeared through a subterranean channel known as the Perte du Rhône, but the rocks which covered it were removed in 1828. After leaving the gorge it becomes again navigable and remains officially so to its mouth. The Saône, the most important tributary, enters the Rhone at Lyons.

Its fall from Lyons to the sea, a distance of 230 miles, is over 530 feet. Its course below Lyons lies in a broad, fertile, and beautiful valley between the Alps and the Cévennes. It receives here two large tributaries, the Isère and the Durance, the latter joining it at Avignon, below which town the river flows through a sandy and arid tract which was formerly a gulf of the sea. Its delta, whose main arms are the Grand and the Petit Rhône, which form the Ile de la Camargue (see BOUCHES-DU-RHÔNE), is growing at the rate of nearly 200 feet annually, owing to the large quantities of sediment carried by the stream. The navigation of the Rhone, owing to the swift current, the shifting of the bed, the numerous islands and the shallow stream, is very difficult even for steamers, and especially on the upstream route. Extensive regulating works have to some extent improved the waterway above the delta, and the shifting and sand-barred mouths of the latter have been obviated by a short canal running from the Gulf of Foz to the main stream, while other canals connect the latter with several ports on the Gulf of Lyons, including Marseilles. See CANALS, *Boat Canals.* Canals also connect the Saône with the Loire, the Seine, and the Rhine.

Consult: Louis Barron, *Les fleuves de la France: Le Rhône* (Paris, 1900); Wood, *In the Valley of the Rhone* (London, 1899); A. Breittmayer, *La Rhône: Sa navigation* (Paris, 1904); R. G. Kingsley, *In the Rhone Country* (New York, 1911). See JETTY.

RHÔNE. A department of southeast France (Map: France, S., J 3). Area, 1104 square miles. It lies almost wholly in the basin of the Rhone and its great affluent the Saône, its eastern boundary being formed by these rivers. The surface is almost entirely mountainous or hilly, the chief level stretches being the valley of the Saône and the district about Lyons. The principal productions are wine and silk. The wines are famous for their excellent quality. About one-tenth of the surface is in vineyards. Silks are manufactured extensively, and numerous other branches of manufacture are actively carried on. Capital, Lyons (q.v.). Pop., 1911, 915,581. Consult C. Lenthéric, *La région du Bas-Rhône* (Paris, 1881), and A. L. Joanne, *Géographie du département du Rhône* (9th ed., ib., 1904).

RHÔNE, BOUCHES-DU-. A department of France. See BOUCHES-DU-RHÔNE.

RHU'BARB (ML. *rhubarbarum, rheubarbarum, reubarbarum, rheum barbarum,* from Gk. ῥῆον βάρβαρον, rhubarb, from ῥῆον, *rheon,* rhubarb, and βάρβαρος, *barbaros,* barbarous, foreign), or PIE PLANT (*Rheum*). A large coarse genus of Asiatic herbs of the family Polygonaceæ, closely allied to *Rumex* (dock and sorrel). The rhubarb of commerce, which comes from inland parts of China or Chinese Tartary, is produced by an unknown species.

The leafstalks of rhubarb contain an agreeable mixture of citric and malic acids, and when young and tender are highly esteemed for stewing and preserving, for which purpose the plants are widely cultivated in temperate and cold countries. Several species have been introduced into cultivation for their leafstalks. *Rheum palmatum,* the first species known, and once believed to yield Turkey rhubarb, has roundish green leafstalks and half-palmate leaves. Its stalks are inferior for the table. *Rheum undulatum, Rheum rhaponticum,* and *Rheum hybridum* have broad, heart-shaped, undivided leaves, upon flattened, often reddish leafstalks grooved on the upper side. In some of the finest varieties the flesh is red. In continental Europe rhubarb is grown more as a foliage plant than as a vegetable. Rhubarb is propagated by seed or by dividing the roots. It prefers a light rich soil, which should be heavily manured every year. The plants are placed three or four feet apart, according to the size of the variety. Rhubarb is forced in winter and early spring by having pots or barrels inverted over it, and fresh litter or horse manure heaped around. It is also forced under greenhouse benches and in cellars, the roots being frozen before removal to the heat. As a medicine rhubarb roots are considered to be cathartic, astringent, and tonic. See Plate of VEGETABLES.

RHUMB (rŭm) **LINE,** or LOXODROMIC LINE. The track of a ship which sails on a constant compass course. It is a curve on the surface of the terrestrial sphere which has the property of cutting all meridians at the same angle. The rhumb line appears as a straight line on Mercator's projection (see Map), and it is this property of the projection which makes it so convenient and useful for navigators. See Loxodrome; Navigation; Sailings.

RHUS, rŭs. A genus of shrubs and trees. See Sumach; Poisonous Plants.

RHYL, rēl. A popular tourist and sea-bathing resort in Flintshire, Wales, at the mouth of the Clwyd, 10 miles northwest of Denbigh (Map: Wales, C 3). It has a fine beach, esplanade, promenade pier, aquarium, and winter garden, golf links, etc. Zinc ore is mined in the vicinity. Much municipal activity has been evinced in public improvements to add to the natural attractions. The town owns its waterworks, gas and electric-lighting plants, markets, and cemetery; maintains promenades, marine walks, and recreation grounds; and has installed modern sewage disposal works. Pop., 1901, 8500; 1911, 9005, with a transient summer population of 20,000.

RHYME, or **RIME** (AS., OHG. *rīm*, number, Ger. *Reim*, rhyme). In the broader meaning, a poem, or versified composition, as when we speak of the "Mother Goose Rhymes"; also a synonym for poetry in general. More technically rhyme is the recurrence of the same sound, in a verse or verses, in syllables having corresponding metrical values. Rhymes are of three general types: they may be formed either by the correspondence of the initial sounds of the rhyming syllables, in which case they are called head rhyme or alliteration; or by the correspondence of the vowel element, in which case, if the succeeding consonant sounds differ, we have assonance, while if these consonants are the same in sound, or if there are no consonants, we have true rhymes. Alliteration was the characteristic rhyme of ancient Teutonic poetry, while assonance prevailed in the early Romance literatures. In modern literature both of these types have yielded in large measure to true rhyme, but they have not entirely ceased to be in good form. Often, in modern poetry, they are used in connection with rhyme. Thus, in *The Symphony*, Sidney Lanier combines rhyme and alliteration:

> Woe *h*im that cunning trades in *h*earts contrives!
> Base *l*ove good women to base *l*oving drives.
> If men *l*oved *l*arger, *l*arger were our *l*ives;
> And *w*ooed they nobler, *w*on they nobler *w*ives.

And in the same poem rhyme and assonance are combined in:

> *Vainly* might Plato's *brain re*volve it;
> *Plainly* the heart of a child could solve it.

The placing of rhyming words in the verse structure varies with the different types of verse composition. Alliteration is characteristically complete in a single verse and in Anglo-Saxon poetry usually consisted of a threefold repetition of the alliterated sound, as in the third and fourth lines of the first quotation above. End rhymes, on the other hand, may be completed within a single verse, but are ordinarily between two or more verses. Not infrequently poems are constructed having both styles of rhyme, as in Shelley's *Cloud:*

> I bring fresh *showers* for the thirsting *flowers*,
> From the seas and the *streams;*
> I bear light *shade* for the leaves when *laid*
> In their noonday *dreams.*

Rhymes, of whatever sort, are in modern poetry always placed upon accented syllables, and end rhymes are characteristically placed either at the end of the verse or at the cæsura, as in the first and third verses here given. They may, however, be placed even at the beginning of the verse, as in the second citation from Lanier's *Symphony.* In complicated structures they are often used with less regard to regularity. In general, however, internal rhymes irregularly placed convey an effect of assonance rather than of true rhyme. As to the relation of rhyming verses, this is determined either by the form of the stanza or in nonstanzaic rhymed composition by some set order, as the couplet. Stanzas are of indefinite variety, and the poet is at liberty to invent forms according to his taste.

Not all languages agree as to the nature of the adequate rhyme. In English, words which rhyme perfectly must agree in all the sound elements succeeding the initial element of the last accented syllable, and in this element they must differ. In French, on the other hand, such a rhyme is only *suffisante*, the *riche* or perfect rhyme having identical *all* the elements in the rhyming syllables. (See *Versification* under French Language.) Thus, *grows* and *rose* form a perfect rhyme in English, *rose* and *arrose* in French. Rarely in English an identical rhyme is used provided the sense be changed (which is also always necessary in French), as *reign* with *rein*, *lo* with *low*, but the change must be more than a mere negation; in no case should *close* and *disclose* be rhymed, nor words having the same root, as *compute, dispute.* When a word is repeated to rhyme with itself, as frequently happens in Poe's poems, it has the value of a refrain rather than of a true rhyme, and in all such cases there should be at least one other word rhymed with it. There are a few words in English the pronunciation of which may be altered to suit the needs of rhyme; thus, *wind* (noun) may be rhymed with *blind*, etc., but this is only a form of poetic archaism. As in French, rhymes are masculine and feminine—masculine when the rhymed syllable is also the chief accent of the word, *aver, deter; mar, tar;* feminine when it is followed by unaccented syllables, *marry, tarry; tenderly, slenderly.* Sometimes a secondary accent is made to carry the rhyme, but in such cases it is generally rhymed with a word having no great rhetorical stress or having other words rhymed with it. The use of feminine rhymes is not common in English, and they are never to be found in the complicated form to be met with in some other languages. (See Rubaiyat.) They occur most freely in satirical verse, which often takes great liberties with rhyme. An example from Lowell is:

> Though you brag of your New World, you don't
> half believe in it;
> And as much of the Old as is possible weave in it.

Rhyme was of relatively slight value in verse which depended upon quantity rather than accent and in languages which abounded in elaborate inflections. It was not until the classical Latin gave way to the vulgar speech that rhyme became the rule, first in the early hymns of the Christian Church. Rhyme was elaborately developed among the Persians and Arabs of mediæval times, but its origin is not known.

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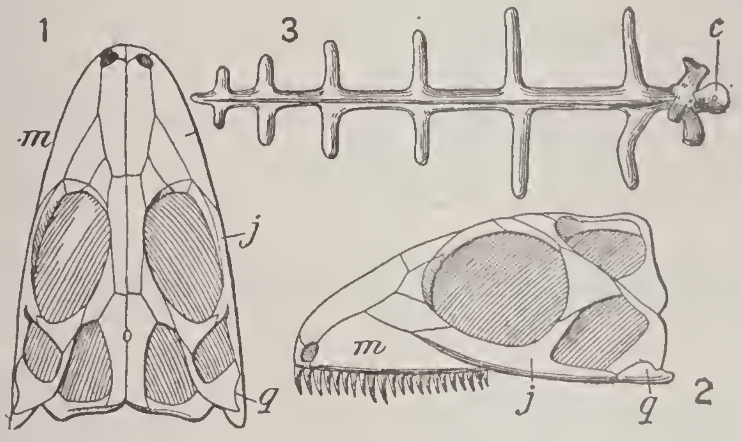
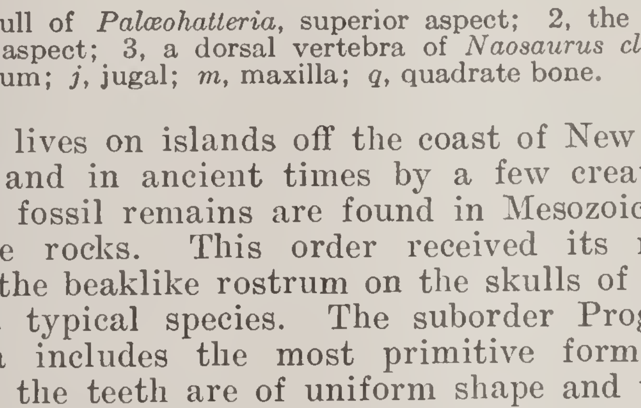
RHYNCHOCEPHALIA, rĭn̲′kō-sē-fā′lĭ-ȧ (Neo-Lat. nom. pl., from Gk. ῥύγχος, *rhynchos*, snout + κεφαλή, *kephalē*, head). An order of primitive reptiles, represented in modern times by a single survivor, *Sphenodon* or *Hatteria*, which lives on islands off the coast of New Zealand, and in ancient times by a few creatures whose fossil remains are found in Mesozoic and Eocene rocks. This order received its name from the beaklike rostrum on the skulls of some of its typical species. The suborder Proganosauria includes the most primitive forms, in which the teeth are of uniform shape and parts of the skeleton are still cartilaginous. *Palæohatteria* from the Lower Permian of Saxony is the earliest known reptile. It had a lizard-like body about 18 inches long, with a long tail, large head, very large eyes, and numerous large conical teeth that are fused with the jaw bones, and also small teeth on the palate. The legs were strong, and the feet were provided with five clawed toes and adapted to progress on land.



PROGANOSAURIA.

1, skull of *Palæohatteria*, superior aspect; 2, the same, lateral aspect; 3, a dorsal vertebra of *Naosaurus claviger:* c, centrum; j, jugal; m, maxilla; q, quadrate bone.



THE RHYNCHOCEPHALIC SKULL.

Cranium of *Hyperodapedon cordoni:* 1, superior aspect; 2, lateral aspect; 3, mandibular symphysis.

A suborder, Pelycosauria, includes several curious though imperfectly known genera in which the anterior teeth are different from the posterior and the dorsal vertebræ are furnished with greatly elongated neural spines.

Allied to the rhynchocephalians and often placed in the group are a number of highly specialized Triassic reptiles, of which the best known is *Hyperodapedon*. They are characterized by more complete ossification of the skeleton, by reduction of the abdominal ribs, and by having uniform marginal teeth.

Consult Von Zittel and Eastman, *Textbook of Paleontology*, vol. ii (New York, 1903).

RHYN′CHONEL′LA (Neo-Lat. nom. pl., from Gk. ῥύγχος, *rhynchos*, snout). A genus of brachiopods, scarce but widespread in modern seas, but very abundant anciently, and represented in almost every geological formation from the Ordovician upward. About 600 species have been described, mostly from the Mesozoic rocks, of which the Jurassic and Cretaceous groups are especially prolific. Most of the ancient forms are doubly convex shells with prominent though small ventral beaks, and with surfaces marked by strong, usually angular radial plications, and with a more or less elevated median fold and sinus. The structure of the shell in most genera is nonpunctate, a character by which the species may most readily be distinguished from the closely similar species of Terebratulidæ. Consult Davidson, "Monograph of the Recent Brachiopoda," in *Transactions of the Linnean Society*, vol. iv (London, 1886–88), and Hall and Clarke, *Paleontology of New York*, vol. viii, part ii (Albany, 1894).

RHY′OLITE (from Gk. ῥύαξ, *rhyax*, stream, especially of lava, from ῥεῖν, *rhein*, to flow + λίθος, *lithos*, stone), LIPARITE, NEVADITE. An igneous rock of porphyritic texture and siliceous composition, generally with a crumply banded (rhyolitic) texture, due to the arrangement of its constituent minerals by flowage. Rhyolites are also frequently glassy, vesicular, scoriaceous, or pumiceous. When compact and massive, rhyolites are designated as rhyolite porphyries (formerly called quartz porphyries, and then supposed to be of geological age older than the Tertiary). In chemical composition rhyolites have about the same range as the granites. Varieties rich in oxide of sodium are designated soda rhyolites (pantellerites). Rhyolites are for the most part surface lavas or are intruded in other rocks as dikes or sills. Very extensive areas of rhyolite are found in the Cordilleran mountain system of the Western Hemisphere. Rhyolites when of unusually coarse grain are now designated by the variety name nevadite.

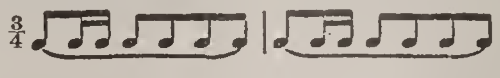
RHYS, rēs, ERNEST (1859–). An English author, editor, and critic, born in London. He was educated at schools in Carmarthen, south Wales, at Bishop Stortford, and at Newcastle-on-Tyne, and became a mining engineer (1877). In 1885 he abandoned this profession for a literary career. In 1887–88 he lectured in the United States. His writings on Welsh subjects are popular in character as contrasted with those of the Celtic scholar Sir John Rhys (q.v.). He edited the "Camelot Series" of popular reprints and translations (65 vols., 1886–91); Dekker's *Plays* for the "Mermaid Series" (1888); *The Lyric Poets* (12 vols., 1894–99); *Literary Pamphlets* (1897); "Everyman's Library" (1906 et seq.); and other works. To various volumes in "Everyman's Library" he contributed valuable introductions, besides serving as general editor of the 600 and more volumes in the series. His writings include: *The Great Cockney Tragedy* (1891); *A London Rose and Other Rhymes* (1894); *Welsh Ballads and Other Poems* (1898); *Frederick Lord Leighton, a biography* (1898, which had been preceded by an earlier study in 1895); two romances, *The Fiddler of Carne*, having a Welsh heroine (1896), and *The Whistling Maid* (1900); *The South Wales Coast* (1911); *Lyric Poetry* (1913); *Romance* (1913); *Rabindranath Tagore* (1915).

RHYS, Sir John (1840–1915). A British Celtic scholar, born in Cardiganshire and educated at Bangor Normal College, Jesus College, Oxford, the Sorbonne, Heidelberg, Leipzig, and Göttingen. He became school inspector for Flint and Denbigh in 1871, fellow of Jesus College in 1881, Hibbert lecturer (1886), and Rhind lecturer on archæology at Edinburgh (1889). In 1877 he had been appointed professor of Celtic at Oxford, and in 1895 he added to his other duties those of principal of Jesus College. Rhys also served on numerous important commissions on education, reforms, and land movements connected with Wales. His best-known works are: *Lectures on Welsh Philology* (1877; 2d ed., 1879); *Celtic Britain* (1882; 2d ed., 1884); *Celtic Heathendom* (1886; 2d ed., 1892); *Studies in the Arthurian Legend* (1891); *Inscriptions and Language of the Northern Picts* (1892); *Rhind Lectures on the Early Ethnology of the British Isles* (1890–91); *Outlines of Manx Phonology* (1894); *Celtic Folk-Lore* (1901); *The Welsh People* (1900; 4th ed., 1909), with D. Brynmor-Jones; *Studies in Early Irish History* (1903); *Celtic Inscriptions of France and Italy* (1906); *Celtic Inscriptions of Gaul and Cisalpine Gaul* (1911–13); *Gleanings in the Italian Field of Celtic Epigraphy* (1914). Professor Rhys also coöperated in the production of several important editions of Welsh texts, and his contributions to Celtic scholarship have been various and important. His studies on folklore, mythology, and religion, although brilliant, have been considered rather bold in conjecture. Professor Rhys was elected a fellow of the British Academy in 1903, was knighted in 1907, and was appointed to the Privy Council in 1911.

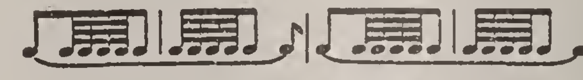
RHYS DAVIDS, Thomas William. See Davids, T. W. Rhys.

RHYTHM (Lat. *rhythmus*, from Gk. *ῥυθμός*, *rhythmos*, rhythm, time, measure, from *ῥεῖν*, *rhein*, Skt. *sru*, to flow). When a succession of discrete auditory, tactual, or visual stimuli is perceived as a succession of groups, we have the perception of rhythm. In this experience the elements so combine that each group appears as a unit, a meaningful whole, much as a series of letters may form a meaningful word. Under analysis the perception of rhythm proves to be a series of sensations which recur at regular intervals and show a regular variation of intensity. Originally the context of the perception (see Perception; Meaning) was doubtless kinæsthetic, and in tactual and visual rhythms kinæsthesis is always present. In auditory rhythms, however, which are more highly developed, kinæsthesis is not invariably observed, and the regular variation of intensity serves of itself to touch off the group meaning. The auditory perception of rhythm is further complicated by two facts: 1. A variation of intensity may be perceived even when the stimuli are uniform in intensity and quality; one hears the ticking of a clock, not as tick, tick, but as *tick*, tick. This "subjective" intensity is a matter of the insistence of certain elements in the stimulus complex; it depends upon a fusion of clearness (see Attention) and some other sensory attribute. 2. An illusion of intensive fluctuation may be set up by change of relative duration, of quality, or of the interval between the recurring stimuli. The subjective reference of these observations has led certain psychologists to regard the rhythmic experience as emotional rather than as perceptive in character. Those who hold this view describe rhythm as a composite feeling, whose components are such partial feelings as strained and fulfilled expectation. The kinæsthesis which accompanies the rhythm is then regarded as a movement expressive of the feeling. See Expression, Expressive Movements.

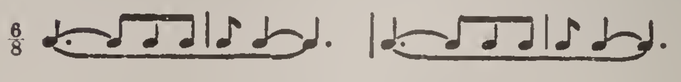
Rhythm in Music. The regular recurrence of tone groups in which the individual notes are symmetrically arranged according to accent and time value. Rhythm is entirely independent of melody or harmony (qq.v.) and can therefore be indicated by notes without reference to pitch. The following examples illustrate this:



Ex. 1. POLONAISE.



Ex. 2. FANDANGO.



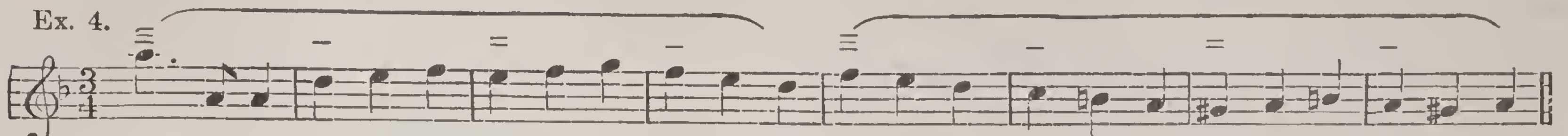
Ex. 3. BEETHOVEN.
(Symphony No. 7.)

In the first example the characteristic rhythmic figure is contained within the limits of a single measure, whereas in the other two examples it fills two measures. It is evident from this that rhythm is not synonymous with accent; for the first beat of every bar has an accent, while in examples 2 and 3, although every bar retains its own accent, there is no special accent or emphasis at the beginning of the rhythmic figure. Accent thus deals with the notes of a single measure; rhythm with groups of notes extending over one or (generally) more measures. Music becomes intelligible only when these larger rhythmic divisions are clearly grasped. A cultivated ear soon tires of constant regularity of rhythm. To avoid monotony, composers resort to various means of breaking the rhythm, such as inserting an odd bar between the regular number of bars composing a rhythmic group, alternating two-bar with three-bar rhythms, or making the weak ending of a phrase coincide with the strong beginning of a new phrase (thus really causing the elision of a bar).

The only simple rhythms are those consisting of a group of notes filling two or three measures (duple and triple rhythm). All rhythms extending over more than three bars are compound. Thus every four-bar rhythm can be resolved into two groups of two bars each. A six-bar rhythm may consist of two groups of three bars each or three groups of two bars each. The Scherzo of

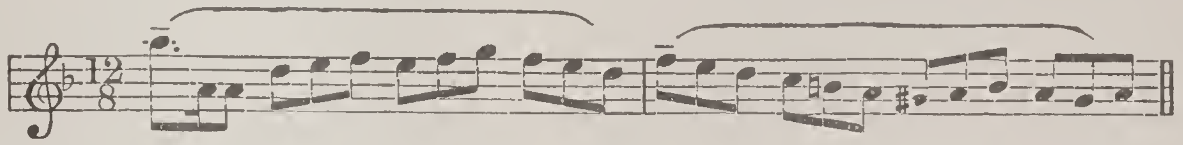
Beethoven's *Ninth Symphony* (see Ex. 4) begins with a theme in quadruple rhythm (two groups of duple rhythm).

Ex. 4.

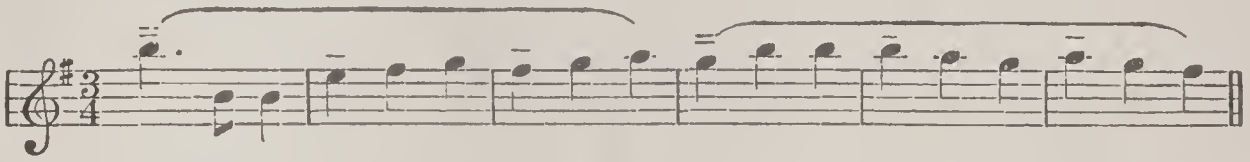


While every bar retains its own accent (marked —), there is a particular emphasis (marked ≡) upon the first and fifth bars (the beginnings of the rhythmic group) and a less emphasis (marked =) upon the third and sixth bars. The effect produced is the same as if the phrase were written in more moderate tempo as in Ex. 5.

Ex. 5.

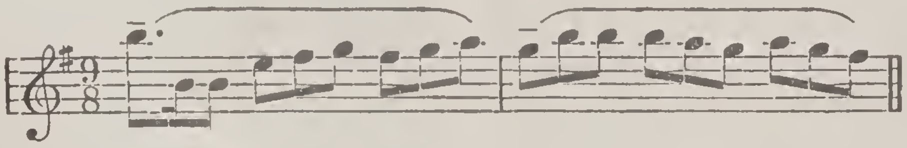


Ex. 6.



After a number of bars Beethoven changes this quadruple to triple rhythm (Ex. 6), which produces the effect shown in Ex. 7.

Ex. 7.



A loose use of language has created a great deal of confusion in regard to the meaning of the term "rhythm." The word is often carelessly employed instead of *accent* or *time*, both of which terms are only subdivisions of rhythm. See Accent; Syncopation; Time.

RHYTI'NA. See Extinct Animals.

RIAD, rē-äd', or **RIYAD** (the garden). The Wahabi capital in the Sultanate of Nedjed, central Arabia. It is built on an extensive open plain in a well-cultivated region. In the centre of the city is a large square containing the market place and the great mosque. The city is a resting place for pilgrims on the way from Persia to Mecca and Medina. Riad dates from 1824. Pop. (est.), 30,000.

RIALL, rī'ąl, Sir Phineas (1775–1851). A British soldier. He was born in Ireland, entered the British army as an ensign in 1794, and soon rose to be major. In 1804 he was attached to the Fifteenth Foot, served for several years with distinction in the West Indies, and in 1810 was brevetted colonel. Three years later he was promoted major general and was sent to Canada to operate against the forces of the United States. In the following winter he destroyed Black Rock, Buffalo, and other villages on the American border, and during the next summer commanded the troops which opposed the invading army under Gen. Jacob Brown. On July 5 he was defeated in the battle of Chippewa. On July 25 at the battle of Lundy's Lane (q.v.), where he commanded the British forces, he was severely wounded and was taken prisoner. In 1816 he was appointed Governor of Grenada, and administered the affairs of that island for several years. He was promoted lieutenant general in 1825, was knighted in 1833, and was made a full general in 1841. Consult H. J. Morgan, *Sketches of Celebrated Canadians and Persons Connected with Canadian History* (Quebec, 1862).

RIALTO, rē-äl'tō (It., from *rio, rivo*, brook + *alto*, deep, high). The chief bridge of Venice, a graceful structure spanning the Grand Canal by a single marble arch 74 feet in length and 32 feet high. The name is derived from Rivoalto, the island on which Venice was founded. Two rows of shops divide the bridge into a broad road and two narrow side passages. The bridge and adjacent district are referred to in Shakespeare's *Merchant of Venice*.

RIANT, rē'än', Paul Edouard Didier, Count (1836–88). A French scholar and historian, born in Paris. He was known as the foremost scholar of his day on the subject of the Crusades, possessed a keen historical sense, skill in research, and marked scholarship in the interpretation of documents. In 1875 he founded the Société de l'Orient Latin, whose object was the publication of geographical and historical documents appertaining to the Crusades and Palestine. He collected an excellent library for the history of the Crusades, and Scandinavian literature, of which Harvard University obtained the former portion and Yale the latter. Among the numerous volumes written and edited by him are: *Expéditions et pèlerinages des Scandinaves en Terre Sainte au temps des croisades* (1865); *Magistri Thadei Neapolitani Hystoria de Desolacione et Conculcacione Civitatis Acconensis . . . 1291* (1874); *Exuviæ Sacræ Constantinopolitanæ* (2 vols., 1876); *Archives de l'Orient Latin* (2 vols., 1881–84). The *Catalogue de la bibliothèque de feu M. le comte Riant* appeared at Paris in 1896–99 (3 vols.). Consult *Revue de l'Orient Latin*, vol. i (Paris, 1893).

RIANZARES, Augustin Fernández Muñoz, Duke of. See María Christina (1806–78).

RIAZAN, ryä-zän'y'. A government in central Russia, consisting of 12 districts and bounded by the Government of Vladimir on the north, Tambov on the east and south, and Tula and Moscow on the west (Map: Russia, E 4). Area, 16,261 square miles. It is divided by the valley of the Oka into two parts, of which the northern is low, marshy, and thickly wooded and the southern is slightly elevated, sparsely wooded, and has a rich black soil. Riazan contains deposits of iron, coal, and various clays, of which iron is mined to a considerable extent.

Agriculture, the principal occupation, is greatly hampered by the inadequate size of the peasants' holdings. Rye and oats are the principal cereals raised for export. Stock raising is in a state of decline. The house industry is but little developed, but the manufacturing industries are making considerable progress. The annual value of the manufactures (principally cotton goods and flour) frequently exceeds $11,000,000. Twelve annual fairs greatly promote this government's trade. Pop., 1913, 2,694,800, consisting principally of Great Russians. Riazan was one of the mediæval principalities of Russia and was annexed to Moscow in 1517.

RIAZAN. The capital of the government of the same name in central Russia, near the confluence of the Trubezh with the Oka, 123 miles southeast of Moscow (Map: Russia, E 4). Riazan manufactures candles, tallow, spirits, and metal goods, and has a considerable trade in grain, wood, animals, and salt. It was the capital of the mediæval Principality of Riazan and is the seat of a Greek Catholic archbishop. Pop., 1910, 41,433.

RIAZ PASHA, rē′äz pȧ-shä′ (1836–1911). An Egyptian statesman. When Ismail Pasha became Khedive of Egypt in 1863 he made Riaz one of his ministers. Later he served as vice president of the commission that undertook to straighten out Ismail's financial difficulties to the satisfaction of European creditors. In 1878–79 he was a member of the first Egyptian cabinet. After the deposition of Ismail, Riaz Pasha was Prime Minister of Khedive Tewfik in 1879–81, and in the following year was Minister of the Interior. He again held the premiership from 1888 to 1891, when he resigned after objecting to the appointment of a British judicial adviser to the Khedive. In the following year Riaz accepted the invitation of Abbas II to form a government, but in 1894 he definitely retired on account of ill health. Riaz effected many reforms during his official career, and Lord Cromer in his farewell speech in 1907 praised him highly.

RIB (AS. *ribb*, OHG. *rippi*, Ger. *Rippe;* connected with OChurch Slav. *rebro*, rib, and probably with Ger. *Rebe*, tendril, OHG. *hirnireba*, brain covering, skull). An elastic arch of bone which with its fellows constitutes, with the vertebral column behind and the sternum or breastbone in front, the osseous part of the walls of the chest. In man there are 12 ribs on each side. The first seven are more directly connected through intervening cartilages with the sternum than the remainder, and hence they are termed vertebrosternal or true ribs; while the other five are known as false ribs, and the last two of these, from being quite free at their anterior extremities, are termed floating ribs. The ribs vary considerably both in their direction and size. The upper ribs are nearly horizontal, but the others lie with the anterior extremity lower than the posterior, this obliquity increasing to the ninth rib and then slightly decreasing. They increase in length from the first to the seventh, and then again diminish. The spaces between the ribs are termed the intercostal spaces. On examining a rib taken from about the middle of the series, we find that it presents two extremities (a posterior or vertebral and an anterior or sternal) and an intervening portion, termed the body or shaft. The posterior extremity presents a head, a neck, and a tuberosity, and articulates with the vertebræ. The shaft presents an external convex and an internal concave surface. A little in front of the tubercle the rib is bent inward and upward, the point where this bending takes place being called the angle. The upper border of the rib is thick and rounded, while the lower border is marked by a deep groove, which lodges the intercostal vessels and nerve.

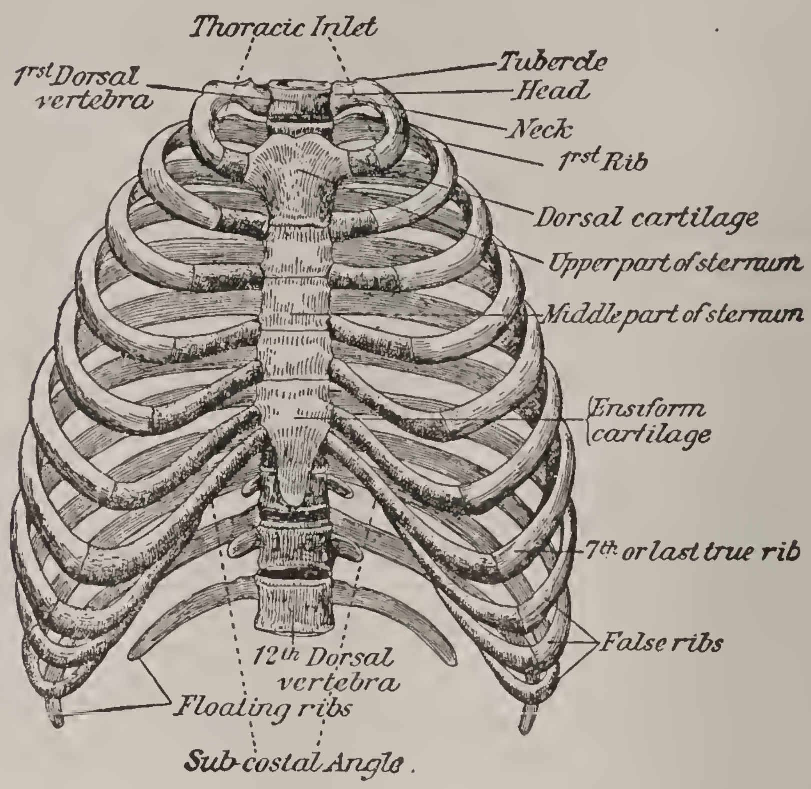


FIG. 1. THORAX, FRONT VIEW.

The ribs of mammals are mostly connected, as in man, with the bodies of two vertebræ and with the transverse processes of the posterior one. In the Monotremata, however, they articulate with the vertebral bodies only; while in the Cetacea the posterior ribs hang down from the transverse processes alone. Their number on each side corresponds with that of the dorsal vertebræ. The greatest number, 23, occurs in the two-toed sloth, while in the Cheiroptera 11 is the ordinary number. In birds each rib articulates by means of a small head with the body of a single vertebra near its anterior border and with the corresponding transverse process by means of the tubercle. Moreover, each rib possesses a diverging appendage, which projects backward over the next rib so as to increase the consolidation of the thoracic framework, necessary for flying. The dorsal vertebræ here never exceed 11, and are commonly 7 or 8 in number, and the ribs proceeding from them are connected with the sternum, not by cartilage, as in mam-

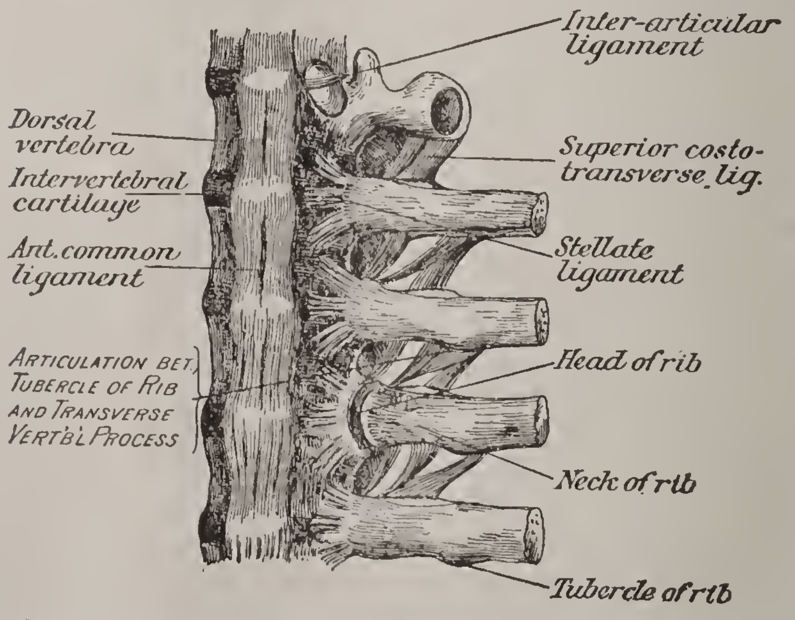


FIG. 2. ARTICULATION OF THE RIBS WITH THE SPINAL COLUMN, FRONT VIEW.

mals, but by true osseous sternal ribs, which are regularly articulated at one end with the sternum and at the other with the termination of the spinal ribs. In the chelonian reptiles the ribs (as well as the vertebræ and the sternum) deviate remarkably from the normal type, the lateral parts of the carapace consisting mainly of ankylosed ribs united by dermal plates. In the crocodiles there are only 12 pairs of true or dorsal ribs, while in the other saurians and in the ophidians the ribs are usually very numerous. In the frogs there are no true ribs, the reason probably being that any bony element in their thoracic walls would interfere with the enormous thoracicoabdominal enlargement which these animals periodically undergo at the breeding period. See SKELETON; SPINAL COLUMN.

RIB. In general, any one of a series of transverse members of a framed structure. In architecture, a projecting band or molding on an arched or flat ceiling. Ribs were first used in Roman architecture, both to divide the vaulting into bays and to provide a preliminary framework to serve in the construction of the rest of the vault. The dome of Hagia Sophia (532–556 A.D.) is built upon a framework of ribs, but the Byzantine builders only rarely used this form of construction. In mediæval architecture ribs became an essential element of vault construction. (See RIBBED VAULTING.) The Renaissance followed Roman precedents in the main; but the great dome of the cathedral of Florence (1420–64), with its eight huge angle ribs and network of subordinate ribs, blended the Roman and mediæval systems, although the ribs are not visible internally. Modern domes are often built with ribs of metal, covered or filled in with other materials.

RIB, FRACTURE OF THE. The rib may be broken as a result of direct violence such as falls or blows upon the chest or by indirect violence as a result of crushing or squeezing. Severe coughing spells in old people have been known to produce a fracture. Fractures occur in all degrees of severity from mere cracks, which may be overlooked, to compound fractures with laceration of the soft parts and penetration of pleura and lungs by sharp fragments. Where the sharp extremity of a broken rib penetrates the pleura and enters the lung, air escapes into the pleural cavity and into the subcutaneous connective tissue. In the latter event the loose tissues become swollen and puffy and give a crackling sensation when touched. This is surgical emphysema and may extend over a considerable portion of the body. Injury to the lungs and pleura may be followed by abscess or emphysema (q.v.). The treatment for uncomplicated fractures consists in the application of broad strips of adhesive plaster which encircle the injured side from the sternum to the spinal column, thus keeping the fragments in apposition and limiting the respiratory movements.

RIBAUT, rē'bō', or **RIBAULT,** JEAN (c.1520–65). A French navigator and colonizer, born at Dieppe. In 1562 he was given command of an expedition organized by the Huguenot leader, Admiral Coligny, which had for its object the founding of a Huguenot colony in America. With his two vessels he explored the Florida coast, and finally, anchoring at Port Royal, built Fort Charles, near the present Beaufort, S. C. Leaving 26 colonists, he went back to France, from which, on account of the civil wars, he was unable to return for some time. Meanwhile the colony had been abandoned. Another settlement of French Protestants, however, had been made in 1564 under Laudonnière at Fort Caroline, on the St. John's River, and in August of the next year Ribaut came over with seven vessels and assumed command of the colony. The appearance of a Spanish squadron, which had been dispatched with orders to kill all the Protestants in the settlement, drove him to sea. He planned to attack the Spaniards in their new settlement at St. Augustine, but his fleet was wrecked and the project was abandoned. Meanwhile the Spanish leader Menéndez had taken Fort Caroline, on the St. John's River. Over 100 of the garrison were murdered by the Spaniards, as well as others of the French forces who later fell into the hands of Menéndez. Ribaut, traveling towards the settlement, was met by Menéndez, and with most of his party surrendered unconditionally. All but a few were put to death, Ribaut himself meeting his fate bravely. Consult Justin Winsor, *Narrative and Critical History of America*, vol. ii (Boston, 1886), and Francis Parkman, "Pioneers of France in the New World," in *France and England in North America*, part i (ib., 1898).

RIB'BECK, (JOHANN CARL) OTTO (1827–98). A German classical scholar. He was born in Erfurt in Saxony, studied in Berlin under Lachmann, Böckh, and Bopp (1845), and in Bonn under Welcker, the "last Hellene," and with Ritschl (q.v.), whose critical method he closely followed. After receiving his degree in Berlin he went to Italy, where he spent a year. In 1853 he became a member of Böckh's seminar at Berlin, and from 1854 to 1877 taught successively at Elberfeld, Bern, Basel, Kiel, and Heidelberg. He became Ritschl's successor at Leipzig in 1877. Ribbeck's peculiar province was Latin poetry, and his great fame was as a bold textual critic. Besides many contributions to the *Rheinisches Museum*, of which he became an editor in 1876, his more typical works are the valuable collection of Latin comic and tragic fragments (1852–55; enlarged 1871–73; 3d ed., 1897–98); the text of Juvenal (1859), which is very radically reconstructed on the general principles of his essay, *Der echte und unechte Juvenal* (1865), in which Ribbeck held satires 1–9 and 11 to be original and all else of the *textus receptus* to be the result of late additions; the great text of Vergil (1859–62; prolegomena, 1866), based on a minute study of the interrelations and history of the manuscripts, but marred by a subjective and fanciful, if brilliant, criticism, which is also to be found in the Horace of 1869; and an edition of Plautus's *Miles Gloriosus* (1881). But his most valuable works were the *Geschichte der römischen Dichtung* (1889–92; 2d ed., 1897–1900) and the masterly *Life* of Ritschl (1879–81). Mention should also be made of his series of classical character sketches *Alazon* (1882), *Kolax* (1883), and *Agroikos*, and of his collected papers, *Reden und Vortragen* (1899). Consult: C. Wachsmuth, *Worte zum Gedächtniss an Otto Ribbeck* (Leipzig, 1898); Emma Ribbeck, *Otto Ribbeck: ein Bild seines Lebens aus seinen Briefen* (ib., 1901); J. E. Sandys, *A History of Classical Scholarship*, vol. iii (Cambridge, 1908).

RIBBED VAULTING. A form of vaulting in which a framework of ribs forms a sort of skeleton dividing the shell of the vault into compartments which are borne by the ribs. The latter, being first constructed, may be used to support the centrings for the construction of the compartments or fillings. In some early Romanesque buildings of the eleventh and twelfth centuries in Lombardy, Normandy, and the Rhine provinces, the ribs follow the lines of the groins in quadripartite vaults and are of simple square section. But in the developed Gothic system (thirteenth century and after) the ribs are richly molded, and often decorated with carved rosettes or bosses at their intersections. The French generally retained a simple framework of wall ribs, transverse ribs, and groin ribs, but the English early employed intermediate ribs (tiercerons) to subdivide the compartments, and later added ridge ribs and bridging ribs (see LIERNE RIB), which they later developed into mere decorations. (See FAN VAULTING.) In German and Spanish vaulting purely decorative ribs were also much used after 1300. For the different varieties of ribbed vaulting, see VAULT; see also GOTHIC ARCHITECTURE; GROINED VAULTING.

RIB'BING, SEVED (1845–). A Swedish physician, born in Stockholm. He studied medicine at the University of Upsala (graduating in 1871) and, after a scientific trip through Europe, became hospital physician in Simrishamn in 1872. In the University of Lund he became assistant professor (1879), professor of practical medicine and director of the medical clinic (1888), and rector of the University (1904). Among his writings are: *Ofversigt af pediatrikens utveckling i Sverige* (1878); *Om ileus* (1882); *Om den sexuella hygienen* (1888), his best-known work, which has seen many editions and translations; *Med hvem får man gifta sig enligt hälsovårdslärans lagar* (1890); *Våra barns fostran och vård* (1892; 3d ed., 1908); *Terapeutisk resepthandbok* (1894; 3d ed., 1903); *Lifförsäkringsläkarens handbok* (1904).

RIBBON. See SILK.

RIBBON (OF. *riban, ruban, rubant,* Fr. *ruban;* perhaps connected with Ir. *ribin*, ribbon, Welsh *rhibin*, streak, Gael. *rib*, hair, rag). In heraldry (q.v.), a diminutive of the ordinary called the bend.

RIBBON FISH. 1. Any of a variety of pelagic fishes characterized by a much elongated and compressed body, especially those of the suborder Tæniostomi, including three families, represented by very few species. They are of very delicate structure, with naked and silvery skin, a long dorsal fin often uniting with the tail fin, a small mouth, and a protractile snout. They are widely distributed from polar to tropical seas, but are nowhere found in abundance, being deep-sea fishes and mere occasional visitants of the coasts. Owing to the delicacy of their frame perfect specimens are seldom obtained. Specimens 20 feet long with a depth of 12 inches and a thickness of only an inch or two have been taken. See OARFISH.

GULF RIBBON FISH (*Eques lanceolatus*).

2. One of the roncadors (q.v.) of the Gulf of Mexico and West Indies, *Eques lanceolatus.* Its generic name is due to the long dorsal spines, suggesting a rider; and its common name to blackish-brown bands which curiously ornament its yellowish-gray body.

RIBBON GRASS. See CANARY GRASS.

RIB'BONISM. The name given to a movement which originated in Ireland about 1808 and took the form of secret associations of Catholics banded together for the purpose of combating the activity of the Orangemen (q.v.), and known as Ribbon societies. The name was derived from the green ribbon which was the badge of the organization.

RIBBON SNAKE. One of the American garter snakes (*Eutænia saurita*), common from Massachusetts to Louisiana, but rare west of the Alleghanies. It is a light chocolate brown above, with three yellow stripes and greenish below. The only peculiarity in its habits is its fondness for water. Two closely similar species are *Eutænia sackenii* of Florida, which is clear olive with straw-colored stripes, and *Eutænia proxima*, of the Mississippi valley and Texas, which is blackish brown, with dull-yellow stripes. See GARTER SNAKE.

RIBEIRO, rê-bā'rō, BERNARDIM (1482–1552). A Portuguese writer of bucolic prose and verse, who was born at Torrão (Alemtejo) and died in Lisbon. Through family influence he was brought to the attention of King Manoel, who sent him to study law (1506–12) at the University of Lisbon. Upon the completion of his studies the King appointed him his secretary. Both he and his cousin, Joanna Zagalo, because they were not permitted to marry, died insane. Bernardim undertook in 1522 a long journey in Italy, during which he wrote his beautiful pastoral *Saudades*, more often called, from the opening words, *Menina e Moça*, which did not appear until 1554, two years after his death. The best modern edition of the first part of this story is that by José Pessanha (Oporto, 1891). The *Obras de Bernardim Ribeiro* were published at Lisbon in 1645, 1785, and 1852. Consult: Visconde Sanches de Baena, *Bernardim Ribeiro* (Lisbon, 1895); Theophilo Braga, *Bernardim Ribeiro e o Bucolismo* (*Christovam Falcão*) (Oporto, 1897); Carolina Michäelis de Vasconcellos, "Portugiesische Litteratur," in Gröber, *Grundriss der romanischen Philologie*, vol. ii, part ii (Strassburg, 1897); A. F. G. Bell, *Poems from the Portuguese, with the Portuguese Text* (Oxford, 1913); id., *Studies in Portuguese Literature* (ib., 1914).

RIBEIRO-FERREIRA, fâr-rā'ê-rȧ, THOMÁS ANTONIO (1831–1901). A Portuguese poet and statesman, born at Parada de Gonta and educated for the bar at Coimbra. In 1862 he was elected deputy and in 1881 was made a peer of the realm, entering the Upper Chamber in 1882. In 1870 he became Secretary General of the Portuguese colonies. He received the colonial portfolio in 1878, that of the Interior in 1881, in 1885 and in 1890 was Minister of Public Works, and in 1895 and 1896 served as Minister to Brazil. In prose he wrote for the press and published two volumes of travels, but he was best known as a poet, with a typically Portuguese languor and grace, but much patriotism withal, as in *Dissonancias* (1891). Earlier poems are: *Sons que passam* (1854) and *Vesperas* (1858), both lyric collections; *Don Jaime* (1861; 6th ed., 1880), a national epic; *Delfina do mal* (1868; rev. 1882), a narrative.

RIBERA, rē̇-bā′rȧ, Jusepe de, called by the Italians Lo Spagnoletto (1588–1656). An historical painter and etcher, Spanish by birth and training, but one of the leading masters of the Neapolitan school and the greatest colorist of Italy in the seventeenth century. He was born at Jativa, Province of Valencia, Jan. 12, 1588. First instructed by Ribalta at Valencia, he received most of his training and spent the greater part of his life in Italy. He studied after the works of the great masters in Rome, then especially after Correggio and the Venetians, from whom he derived his vivacity of color. He formed his style, however, chiefly after Caravaggio, of whom he seems to have been an independent follower rather than a direct pupil. After years of vicissitude he settled at Naples, where he secured a patron in the rich picture dealer Cortese, whose daughter he married. Like Caravaggio's pictures Ribera's exhibit a wild, extravagant fancy, but great vigor, and, although imbued with the darkness of shadow masses peculiar to the Neapolitan Tenebrosi (darklings), they show a much finer instinct of the chiaroscuro. He delights in scenes of horror, such as tortures and martyrdoms of all kinds, but occasionally shows also poetic charm, and was the first to combine realism with the Roman Catholic spirit. He painted numerous heads and half figures of hermits, saints, and philosophers with great anatomical exactness. Especially good are his various representations of the "Martyrdom of St. Bartholomew," examples of which are in the museums of Madrid, Berlin, and Dresden. Among his finest paintings are the "Immaculate Conception" (1635), in the convent of the Augustine Recollets at Salamanca, excelling in splendor of color and light and in the charm of the Virgin's figure the representations of this subject by Murillo, Guido Reni, and Rubens; the "Descent from the Cross" (1637), admirable for its delineation of pain, and "Communion of the Apostles," both in San Martino, Naples; the "Adoration of the Shepherds" (1650), in the Louvre; the "Martyrdom of St. Lawrence," in the Vatican; a "Pietà," in the National Gallery, London; "St. Mary of Egypt Praying at her Grave" (1641), in the Dresden Museum, of exceptional charm in form as in color. Of the 50 pictures in the Madrid Museum the best known are: "Jacob's Dream"; "The Immaculate Conception"; "Isaac Blessing Jacob"; "Magdalen"; "St. Rochus"; "Prometheus"; "The Blind Sculptor of Gambazo." Ribera is well represented also in the Academy of San Fernando, Madrid, and in the Escorial. Of singular interest is a half figure of "Homer as Improviser with the Violin," in the Turin Gallery, and his latest work, the "St. Sebastian" (1651), in the Museum of Naples. In New York he is represented by an "Assumption" in the Hispanic Society and by a fine "Lucretia" in the Metropolitan Museum. Of his 26 etchings the best known are "The Drunken Silenus with Satyrs" (1628), the equestrian portrait of "Don Juan d'Austria" (1648), two of "St. Jerome," and "Satyr Scourged by Cupid." Consult: A. L. Mayer, *Jusepe de Ribera* (Berlin, 1907), the best and most complete life; also Lafond, *Ribera et Zurbaran* (Paris, 1902), and C. G. Hartley, *A Record of Spanish Painting* (London, 1904).

RIBHUS, rĭb′ụz (Skt. *ṛbhu*, dexterous, from *rabh*, Gk. *λαμβάνειν*, *lambanein*, to take). In Vedic mythology, a group of three gods who were originally mortals. They are closely associated with Indra and also with Savitar, the sun, while in their appearance they are like the sun and ride in a bright car drawn by fat steeds. They are most frequently mentioned as the artisans of the gods, and accomplish five marvelous feats. Some scholars regard them as the three seasons which are at a standstill during the 12 days of the winter solstice. Consult: Nève, *Essai sur le mythe des Ṛibhavas* (Paris, 1847); Ryder, *Die Ṛbhu's im Ṛgveda* (Gütersloh, 1901); L. D. Barnett, *Antiquities of India* (London, 1913).

RIBOT, rē̇′bō̇′, Alexander Félix Joseph (1842–). A French statesman, born in Saint-Omer (Pas-de-Calais) and educated for the law in Paris. He was one of the founders of the Société de Législation Comparée, was for two years (1875–77) director of criminal affairs in and Secretary of the Department of Justice, and in 1878 was elected a deputy. He became a Moderate Republican, and in his general conservatism was especially prominent as an opponent of Gambetta's radicalism and of the colonial policy of the Ferry cabinet. In 1890 he became Foreign Minister in Freycinet's cabinet, a portfolio which he held also under Loubet. From December, 1892, to March, 1893, he was president of the cabinet. He was active in promoting friendly relations with Russia and England and contributed much to the formation of the Dual Alliance. On Faure's election, in 1895, Ribot was again called to form a cabinet, which, however, lasted for a very short time. In 1905, while accepting the principle of the separation of church and state, he was successful in forcing upon the government important modifications favorable to the Catholic church. Ribot was Minister of Finance in Viviani's second cabinet (formed 1914) and in that of Briand, which succeeded it in October, 1915. In 1906 he was elected to the French Academy. He is the author, among other works, of *Quatre années d'opposition* (1905) and of studies in British political history.

RIBOT, rē̇′bō̇′, (Augustin) Théodule (1823–91). A French genre, historical, and portrait painter and etcher. He was born at Saint-Nicolas-d'Attez (Eure). After a youth of poverty he went to Paris in 1851, worked for a while under Glaize, and studied Chardin and the great Dutch and Spanish masters in the Louvre. He assimilated something from all of them, yet developed a distinct individuality. In kindred themes he shows almost as great power of expression and mastery of style as Frans Hals and Ribera, but in landscape and marines he lacks the modern conception of light and air. When nearly 40 he began his exhibits at the Salon by a series of still-life pictures and kitchen scenes, painted broadly with strong Rembrandt-like effects of light and shade. These include "Cooks at Dinner Time" (1861) and "Plucking Poultry" (1863). He then turned to religious subjects, which he interpreted with forceful realism. The finest of these, "St. Sebastian," "The Good Samaritan," and "Jesus in the Temple," are in the Luxembourg. His later works were mainly portrait heads, chiefly of old people, which are wonderful studies of wrinkled flesh and intense expression. He was decorated with the Legion of Honor. Ribot also etched about two dozen plates of great strength and distinction. Consult Fourcaud, *Théodule Ribot* (Paris, 1892).

RIBOT, Théodule Armand (1839–1916). A French psychologist. He was born at Guingamp, Dec. 18, 1839, and was educated at the Lycée de Saint-Brieure and at the Ecole Normale, Paris, where he received a doctor's degree in 1875. After serving for several years as professor of philosophy at various lycées, he went to Paris and turned to the investigation of experimental and physiological psychology in the histological and physiological laboratories and at the clinics of the insane asylums. In 1876 he founded the *Revue Philosophique*, of which he became the editor. In 1885 he was given charge of a course in experimental psychology at the Sorbonne and in 1888 was called to the chair of experimental and comparative psychology in the Collège de France. Ribot took a leading part in the development of psychology in France, adopting the best methods of both the German and the English psychologists; at the same time his work was characteristically French in breadth of view. Especially valuable are his psychopathological studies and the analytical and comparative treatment of distinctive types or fields of mental phenomena in his later books. His writings, which have seen many editions and the most important of which have been translated into English, include: *La psychologie anglaise contemporaine* (1870); *L'Hérédité psychologique* (1873); *Philosophie de Schopenhauer* (1874); *Psychologie allemande contemporaine* (1879); *Les maladies de la mémoire* (1881); *Les maladies de la volonté* (1883); *Les maladies de la personnalité* (1885); *La psychologie de l'attention* (1889); *Psychologie des sentiments* (1896); *L'Evolution des idées générales* (1897); *Essai sur l'imagination créatrice* (1900); *Essai sur les passions* (1906; 3d ed., 1910); *Problèmes de psychologie affective* (1910); *La vie inconsciente et les mouvements* (1913).

RICARD, John. See Ricord, John.

RICARDO, rē̇-kär′dō̇, David (1772-1823). An eminent English political economist, born in London. His father, a Jew from Holland, gave him an education in a commercial school in that country. When 14 years of age Ricardo left school to engage in his father's business on the stock exchange, for which he showed remarkable aptitude. At 19 he entered the Church of England and was renounced by his father. Thrown upon the world without resources, he set up as a broker, with such success that he was reckoned a man of wealth by the time he was 25 years of age. It was about this time that he was attracted to the works of Adam Smith, and he began to devote himself to economic studies, though he did not wholly withdraw from business life until 1818. His first publication on economic studies was a pamphlet issued in 1809 and entitled *The High Price of Bullion a Proof of the Depreciation of Bank Notes.* This work created considerable stir and received, as it were, official confirmation in the famous Report of the Bullion Committee in 1811, in the drafting of which Ricardo is reported to have had great influence. A series of pamphlets on financial subjects followed this first venture, and in 1817 appeared his *Principles of Political Economy and Taxation*, on which his fame chiefly rests. In 1819 he entered the House of Commons, and while his diffidence prevented him from becoming a notable speaker, he maintained there a high authority upon all matters pertaining to finance and taxation until his death.

Ricardo exercised a greater influence upon economic thought than any other of the earlier writers except Adam Smith. His writings on taxation are abstract and throw considerable light upon the problems of incidence of taxes. The most complete part of his work is his discussion of currency. His is the first adequate and clear statement of the quantity theory of money. (See Money.) The doctrine of comparative costs (see International Trade) is one of his most important discoveries in the realm of international trade. See Political Economy.

RICASOLI, rē̇-kä′sō̇-lē̇, Bettino, Baron (1809-80). An Italian statesman, born at Florence. He was a descendant of an ancient Lombard family, studied at Pisa and Florence, and passed the early years of his life on his estate devoted to the study of agriculture, on which subject he wrote a number of useful works. In 1847 he appeared in politics as a leader of the Moderate Liberals and an advocate of Italian unity and was elected mayor of Florence. In 1849 as a member of the executive commission he was instrumental in recalling the Grand Duke Leopold, trusting to the constitutional promises given by the latter. Leopold returned accompanied by the Austrians, and Ricasoli, indignant at this treachery, retired into private life. In 1859 he assumed the leadership of the Liberal movement in Tuscany, and after the flight of the Grand Duke was made Dictator (August 1). In this office he exerted himself for the union of Tuscany with Sardinia, which was brought about in March, 1860. In the same month he was made Governor-General of Tuscany. On the death of Cavour (June, 1861) Ricasoli was called to the head of the ministry. His cabinet, however, could not withstand the Radical assault, and he resigned in March, 1862. He returned to power in June, 1866, and retired in April of the following year, when he was succeeded by Ratazzi. Consult his *Lettere e documenti* (10 vols., Florence, 1888-95) and Ongaro, *Bettino Ricasoli* (Turin, 1861).

RICCATI, rē̇k-kä′tē̇, Jacopo Francesco, Count (1676-1754). An Italian mathematician, born at Venice. In 1696 he graduated from the University of Padua. Among his contributions to the *Acta Eruditorum* of Leipzig was the famous problem known as Riccati's equation, published in September, 1724. After his death his works were collected and published as the *Opere del conte Jacopo Riccati* (4 vols., 1758; 2d ed., 1765).

RICCI, rĭt′chē̇, Federigo (1809-77). An Italian dramatic composer, born in Naples. He was educated in music at the Conservatory of San Sebastiano, after which he followed his older brother to Rome. His first great success was won by the opera *La prigione d' Edimburgo* (1837), which was followed by the scarcely less successful *Un duello sotto Richelieu* (1839), *Michelangelo e Rolla* (1841), and *Corrado d' Altamura.* In 1853 he went to St. Petersburg as inspector of the vocal classes in the Theatre School, and about 1870 left that city to superintend personally his own musical productions in Paris. One or two of his operas had been translated and adapted for the French stage, and their success led him to bid for French favor with the more ambitious operas *Docteur Rose* (1872) and *Chi dura vince.* He was disappointed, however, and in 1876 returned to Italy. Additional compositions included masses, cantatas, songs, as well as several other operas. He died at Conegliano.

RICCI, Luigi (1805-59). An Italian dramatic composer. He was born in Naples and, like his brother Federigo, was educated at the Conservatory of San Sebastiano, Naples. He composed several very successful operas which he presented in rapid succession, and in 1836 became maestro di capella at the cathedral of Triest and vocal director of the city theatre. After this much of his work was done in collaboration with his brother until 1859, when he was stricken with disease of the brain and after confinement in the Prague asylum died there. He wrote about 30 operas, of which perhaps *La festa di Piedigrotta* (1852) and *Il diavolo a quattro* (1859), written jointly with his brother, are among the best. His masterpiece, however, was *Crispino e la comare* (1850), one of the best comic operas of Italy and the only one still performed outside of it. Other compositions include masses, sacred and secular songs, and duets.

RICCI, Matteo (1552–1610). The founder of the Jesuit missions in China and a celebrated astronomer, born at Macerata, Italy. After studying law at Rome he entered the Society of Jesus in 1571. In 1578, while still a scholastic, he went on the mission to India. There he was ordained, and because of his ability in Eastern languages, especially in Chinese, was selected to found the mission in China and proceeded to Macao. After residing in Chow-King, the capital of Canton, and at other places for some years, he resolved to make his way to Peking, and in the dress of a Chinese scholar succeeded in reaching Nanking (1595), but was not allowed to remain long. Later he wrote a series of didactic works in Chinese, one a *Dialogue of Friendship*, in imitation of Cicero, which so pleased the Chinese mandarins that he obtained the permission to go to Peking. He presented to the Emperor a telescope and various astronomical instruments, which were still in the palace when the allies forced an entrance in 1900. After this he was allowed to reside at Nanking. In 1601 he obtained permission to build a church and found a mission in Peking itself. Before long his mathematical teaching and classical Chinese style obtained for him great prestige. He became a special favorite of the Emperor, and through his influence Christianity was introduced into the principal cities of China. There is an important work by him which contains a number of valuable observations on the geography and history of China. Ricci published several works in Chinese which attracted the attention of Chinese literati by the purity of their style. His book *On the Nature of God*, written in Chinese, has been admitted into the number of Chinese classics. Consult biographies by Saïnte-Foi (Paris, 1859), Werfer (2d ed., Regensburg, 1870), Natali (Rome, 1900), and De Ursis (ib., 1910).

RICCI, Scipione de (1741–1810). An Italian bishop, born at Florence. He was ordained a priest in 1766. For some time he was auditor to the Papal Nuncio at Florence, and in 1780 was appointed Bishop of Pistoia and Prato. He attempted to introduce certain reforms in the Church, but though he was supported by the Grand Duke Leopold, brother of Emperor Joseph II and his reform measures were approved by the diocesan Synod of Pistoia in 1786, he was opposed at the general Tuscan Synod, held at Florence in 1787. When Leopold left Tuscany Ricci was forced by the anger of the populace to flee from Pistoia (April, 1790), and he formally renounced his episcopal dignity in June, 1791. In 1794 Pope Pius VI condemned 85 propositions of the Pistoia Synod. Ricci was imprisoned in 1799, but he was released in 1805 by Pius VII after retracting his statements. Consult L. J. A. de Potter, *Vie et mémoires de Ricci* (4 vols., Paris, 1826), and *Memoirs of Ricci*, edited by Thomas Roscoe (2 vols., London, 1829).

RICCI, Sebastiano (1660–1734). An Italian decorative painter of the Venetian school, born at Cividale di Belluno. He was a pupil in Venice of Cervelli and worked in various Italian cities. Afterward he visited Austria and England, where he remained 10 years. His works there include the decorations of the chapel at Bulstrode for the Duke of Portland, of the hall at Burlington House, and those in the chapel of Chelsea Hospital. His paintings "The Continence of Scipio" and "The Dinner at Simon's House" are at Hampton Court. Characteristic frescoes are in the Gesuati and other churches in Venice. Ricci was an able decorator, possessing great facility, but also the exaggeration and mannerisms of the baroque.

RICCIARELLI DA VOLTERRA, rĭt'chär-ĕl'lē̇ dȧ vŏl-tĕr'rȧ, Daniele. See Volterra.

RICCIO, rĭt'chō̇, Andrea Briosco (c.1470–1532). An Italian sculptor and architect of the Renaissance. In Padua, where he was born, he built the church of Santa Giustina, and for San Antonio in the same city he designed a great bronze paschal candelabrum. In San Fermo, Verona, is another of his masterpieces, the bronze and marble tomb of Girolamo della Torre.

RICCIO, David. See Rizzio.

RICCIO, rĭt'chō̇, Domenico, called Brusasorci (1494–1567). An Italian painter of the Veronese school. He was the pupil of Caroto, and was influenced by Titian, Torbido, Parmigiano, and Michelangelo. His importance is chiefly historical; he introduced new and modern methods of composition and of treating color and light. Berenson calls him "the first purely pictorial artist in Italy." His work, however, is unequal and lacks harmony. Most of his works are to be found in his native city. The finest are "Vision of the Madonna," an altarpiece in St. Eufemia; frescoes of landscapes and busts of popes, in the Bishop's Palace; and the historical frescoes depicting the "Coronation Procession of Charles V in Bologna," in the Ridolfi Palace. He is also represented in the Johnson collection, Philadelphia.—Domenico's son Felice (1540–1605), also called Brusasorci, studied under Ligozzi in Florence. A number of his religious paintings are in the Verona churches.

RICCOBONI, rĭk'kō̇-bō'nē̇, Luigi (?1674 1753). An Italian actor and dramatist, born at Modena between 1674 and 1677. In 1699 he became director of a company of players, by whose aid he did away with the traditional Italian comedy of masks, and presented the *Pastor fido* and other dramas of importance. Opposition to him at Venice and in the Lombard towns caused him to withdraw to Paris, where from 1716 to 1729 he conducted an Italian theatre in the Hôtel de Bourgogne. He returned thence after a brief residence at Parma (1729–31). His publications include the *Histoire du théâtre italien* (1728–31).

RICCOBONI, Marie Jeanne Laboras de Mézières (1714–92). A French novelist, daughter-in-law of Lodovico Riccoboni. She was born in Paris and was at first an actress. She wrote the once popular novels of society, *Histoire du marquis de Crécy* (1758), *Lettres de milady Catesby* (1759–60), *Ernestine*, etc., and is known for her continuation (1765) of *Marianne*, by Marivaux (q.v.). Her *Œuvres* were published in nine volumes (Paris, 1826), with biographical and critical notices.

RICE (OF. *ris*, Fr. *riz*, from ML. *orysum*, Lat. *oryza*, from Gk. ὄρυζα, *oryza*, ὄρυζον, *oryzon*, rice; connected with Afghan *vrizi*, Skt. *vrihi*, rice). A genus of grasses of which the only important species is the common rice (*Oryza sativa*), one of the most useful and extensively cultivated grains, supplying the principal food of one-half of the human race. It seems to have been originally a native of the East Indies, but has spread to all quarters of the globe, wherever the conditions of warmth and moisture are suitable. It is adapted to subtropical climates rather than tropical or cold temperatures. Rice is an annual, varying from 2 to 5 feet in height. The seed or grain grows on little separate stalks, springing from the main stalk, and the whole appearance of the plant, when the grain is ripe, may be said to be intermediate between that of barley and oats. Rice requires a moist soil, artificially flooded at certain seasons. There are, however, varieties called upland rice that do not require flooding. The cultivation is most extensively carried on in India, China, and other southeastern parts of Asia, Japan, Egypt, the southern countries of Europe, and the South Atlantic and Gulf States, together with Arkansas and California, in the United States. The South Carolina product is of the best on the market. Rice is known in India as paddy—a term also used to designate rice in the husk. See Plate of Cereals.

In China, where, as in other warm countries, two crops may be obtained in a year, rice is generally sown thickly on very wet land and afterward transplanted to the land which it is finally to occupy. The plants tiller or spread at the root very much, so that each sends up several or many stalks. The rice grounds are carefully weeded, although often so wet that the workmen may sink to their knees.

The origin of the regular production of rice in America is referred to the latter part of the seventeenth century, when a vessel from Madagascar is said to have brought a sack of the grain to Charleston, S. C. This yielded well, the culture spread, and eventually rice became the staple product of that State, until the War of the Rebellion checked it. The mode of cultivation best adapted to the plant in South Carolina has been found to be by irrigation, and it is grown chiefly where the land was formerly overflowed by the tides. The cultivation of rice spread rapidly to most of the Southern States, but of late years Louisiana, Texas, and Arkansas have been the most successful in its cultivation. The prairies of the southern parts of the States have proved to be well suited to the cultivation of rice. The land is irrigated by pumping water from rivers and wells and so regulated as to permit of the use of machinery, as in growing other small grains. The ground is plowed, harrowed, and rolled, and the seed planted with drills. The ground is allowed to dry sufficiently at harvest time to enable the use of binders, and the grain is afterward threshed with machine threshers. It is also grown on lowlands subject to overflow from the river, with due precautions against a possible crevasse. The water is conveyed by ditches and laterals, and is alternately turned on and drained off, as the condition of the plants' progress may demand. When the rice is mature the water is drained off and the rice cut and dried. After threshing it is winnowed and placed in sacks, ready for the mill or market. The upland rice is dry-cultivated, and is claimed by some planters to be better than the lowland. It is grown upon high and dry land, but the yield is not so generous as on the low land. The milling of rice consists in removing the outer husk or coat. From the thresher the rice is sent to the mills in sacks or in barrels, the latter holding 162 pounds each. From this quantity of rough rice the mills secure 95 pounds of clean rice, 8 pounds of polish, 30 pounds of bran, and 29 pounds of waste. The rice polish and rice bran are mixed and sold as a feeding stuff under the name of rice feed or rice meal. It is very nutritious.

The production of rice in the United States reaches about 25,000,000 bushels annually. The commercial standard weight of rough rice is 45 pounds per bushel. The principal rice-growing States in decreasing order of production are Louisiana, Texas, Arkansas, California, and South Carolina. In California the first commercial crop was grown in 1912. The 1913 rice crop under the American flag was, Continental United States 715,111,000 pounds, Hawaii 25,800,000, Philippine Islands 1,377,875,000.

The world's recorded production reaches about 100,000,000,000 pounds per annum, of which Asia furnishes approximately 96 per cent, Europe 1 per cent, Africa, South America, and North America 2 per cent. The above figures of 100,000,000,000 pounds do not fully represent world production, as no statistics of the production of China and certain other areas are available. The production in southern China is doubtless large, reports from three provinces placing the product of 1910 at 47,200,000,000 pounds.

Canada rice (*Zizania aquatica*), the wild rice of North America, is a species of another genus of grass quite different from the true rice. It is particularly abundant in the Northwest, growing in miry places or shallow water, often in the margins of lakes. The seeds are about half an inch long, slender, farinaceous, affording very good meal, and used to some extent by the Indians where the plant abounds. Owing to its tendency to scatter its seed its production has not reached any economic importance.

Aside from its use as food (see below) rice is subjected to fermentation in many countries. The beer made from it (sake) is in general use among the Japanese. Several kinds of highly esteemed intoxicating liquors are made from rice by the Chinese. A spirit is also distilled from the lees. Rice starch is made in considerable quantity and is used in laundries and muslin factories. Rice straw is used to make bonnets and also to some extent as a feed for cattle.

Feeding Value. The rice grain is not directly used as a food for farm animals. However, its by-products, chaff meal, bran, and polish, are fed especially in regions where rice is grown. The straw also has a feeding value.

Rice bran and rice meal contain more or less of the germ, and are fed to dairy cows and pigs. According to recent experiments rice meal has practically the same value for pigs as corn meal when fed in addition to skim milk. Rice polish is a fine powder of high nutritive value and is very valuable for cows, pigs, etc. As it is rich in both nitrogen and potash, it produces a valuable manure. Rice hulls are too woody to be of much food value. They are largely used for packing around breakable articles. Unlike most cereal grains rice is seldom made into bread or cakes, but is eaten boiled. In China, Japan, and other countries where the majority of the people cannot obtain animal food, rice, which is rather deficient in protein, is supplemented by special products made from the soy bean (q.v.), which are rich in protein.

WILD RICE (*Zizania aquatica*).

Rice flour has the following percentage composition: water, 8.5; protein, 8.6; fat, 6.1; nitrogen-free extract, 51.9; crude fibre, 16.1; ash, 8.8.

RICE, Alice (Caldwell) Hegan (1870–). An American novelist, born at Shelbyville, Ky. Her *Mrs. Wiggs of the Cabbage Patch* (1901) captured the popular fancy with its humanness and its humor and was a great success. The year following its appearance the author married the poet Cale Young Rice (q.v.). In addition to the novel just named she published: *Lovey Mary* (1903); *Sandy* (1905); *Captain June* (1907); *Mr. Opp* (1909); *A Romance of Billy-Goat Hill* (1912); *The Honorable Percival* (1914). Several of these were translated into German, French, Danish, and Swedish, and three (*Mrs. Wiggs, Mr. Opp,* and *The Romance of Billy-Goat Hill*) were dramatized. Both before and after she became a novelist she was favorably known also for short stories contributed to the magazines.

RICE, Allen Thorndike (1853–89). An American editor, born in Boston, Mass. He graduated at Oxford University in 1875 and in 1876 bought the *North American Review*, of which he subsequently became the editor. In 1879 he promoted the Charnay (q.v.) expedition, which, under the patronage of France and the United States, was sent to investigate the remains of primitive civilization in Central America and Mexico. He was the first to recommend the introduction into the United States of the Australian ballot system. He edited *Reminiscences of Abraham Lincoln* (1886) and was a contributor to *Ancient Cities of the New World* (1887).

RICE, Cale Young (1872–). An American poet and dramatist, born at Dixon, Ky., and educated at Cumberland University and at Harvard (A.B., 1895; A.M., 1896). His verse was published under the titles: *From Dusk to Dusk* (1898); *With Omar* (1900); *Song Surf* (1900); *Nirvana Days* (1908); *Many Gods* (1910); *At the World's Heart* (1914). His plays include: *Charles di Tocca* (1903); *Yolanda of Cypress* (1906); *A Night in Avignon* (1907); *The Immortal Lure* (1911); *Porzia* (1913);—all poetic dramas. In 1915 appeared in two volumes his *Collected Plays and Poems.* For his wife, see Rice, Alice (Caldwell) Hegan.

RICE, Daniel (1822–1900). An American circus performer, born in New York City. Originally his name was McLaren. He became an acrobat, traveled as a circus clown, and, after winning wide popularity, established a show of his own. He was also very successful financially and devoted considerable sums to charitable and public purposes. During the Civil War he promoted recruiting and subsequently delivered occasional lectures in favor of temperance. He afterward lived in Cincinnati, Ohio, and later in Texas. As a clown probably no other man, except perhaps George L. Fox, won such lasting recognition as did Rice.

RICE, Edwin Wilbur, Jr. (1862–). An American engineer. He was born at La Crosse, Wis., and graduated at the Central High School of Philadelphia in 1880. He then engaged in practice as an electrical engineer, and was superintendent of the Thomson-Houston Electric Company in 1883–88. Becoming connected with the General Electric Company in 1884, he was its technical director until 1894, then vice president until 1913, and thereafter president.

RICE, James (1843–82). An English novelist, born at Northampton. He studied at Queens' College, Cambridge, and was called to the bar at Lincoln's Inn (1871). As editor and proprietor of *Once a Week* from 1868 to 1872 he made the acquaintance of Walter Besant (q.v.), with whom he collaborated on the novels *Ready Money Mortiboy* (1872), successfully dramatized (1874); *The Golden Butterfly* (1876); *The Monks of Thelema* (1877); *The Seamy Side* (1881); etc. Of these perhaps *The Golden Butterfly* and *Ready Money Mortiboy* are the most vigorous. Rice also wrote a gossipy *History of the British Turf* (1879).

RICE, Luther (1783–1836). An American clergyman, born at Northboro, Mass. He graduated at Williams College in 1810 and afterward studied theology at Andover Seminary. While at Andover he took part with Adoniram Judson and others in a missionary propaganda which induced Massachusetts evangelical clergymen and philanthropists to found the American Board of Commissioners for Foreign Missions. (See MISSIONS.) He went to India as a missionary in 1812, and soon after his arrival he left the Congregationalists and joined the Baptist church, as his friend Adoniram Judson had done a few weeks before. He returned to the United States in 1813 and devoted himself to organizing missionary societies and raising funds among the Baptists. Largely through his efforts Columbian University, at Washington, was founded, and for many years he was its treasurer and devoted much energy to its welfare.

RICE, THOMAS D. (1808–60). An American comedian, born in New York City. He was apprenticed to a wood carver, but was attracted to the theatre, where for a time he served as a supernumerary. Soon, however, he turned to negro minstrelsy, in which he became famous in both America and Great Britain. By many he was held to be without equal in his peculiar branch of comic acting. Among his popular performances were the burlesque tragedy *Othello,* the farces *Jumbo Jum* and *The Virginia Mammy,* and *Bone Squash Diavolo,* a travesty on *Fra Diavolo.* Many of his songs, such as "Lucy Long," "Jim Crow," and "Sich a Gittin' Upstairs," held a place among the songs of the people in his day. At the height of his success Rice was noted for his eccentric extravagance, but he died in poverty.

RICE, WILLIAM MARSH (1816–1900). An American millionaire, born in Massachusetts. He accumulated a large fortune in the cotton business in Texas. After his death it was proved that he had been chloroformed by his valet, who had conspired with Albert T. Patrick (q.v.). Practically all of Rice's fortune, estimated at $10,000,000, went to endow Rice Institute (q.v.) at Houston, Tex.

RICE, WILLIAM NORTH (1845–). An American geologist, born at Marblehead, Mass. He graduated at Wesleyan University in 1865 and received the degree of Ph.D. from Yale in 1867. From that year he was professor of geology at Wesleyan, of which university he was acting president in 1907–09. He was also an assistant to the United States Fish Commission in 1873–74, and assistant geologist to the United States Geological Survey in 1891–92. In 1891 he served as president of the American Society of Naturalists. Rice wrote: *Geology of Bermuda* (1884); *Science Teaching in the Schools* (1889); *Twenty-five Years of Scientific Progress and Other Essays* (1894); *Christian Faith in an Age of Science* (1903; 2d ed., 1904); *Manual of the Geology of Connecticut* (1906), with H. E. Gregory; *Problems of American Geology* (1914), with others.

RICE'BIRD'. The name in the Gulf States of the bobolink (q.v.). See JAVA SPARROW.

RICE INSECTS. The rice weevil (*Calandra oryzæ*) is a cosmopolitan insect, which probably originated in India and has been diffused by commerce until it is found in most grain-growing countries. In the southern United States it is known as black weevil. It feeds upon the grain of rice, wheat, corn, barley, rye, oats, and sorghum, and also infests such breadstuffs as crackers and cakes, and is frequently found in flour and meal. It was originally bred from rice, whence its specific name; and it is amenable to the same bisulphide-of-carbon treatment ordinarily applied for other insects injuring stored grain. The rice grub of the southern United States is the larva of a scarabæid beetle (*Chalepus trachypygus*), which looks like the ordinary white grub. It feeds upon the roots of upland rice, but in fields which are frequently overflowed it cannot exist. The so-called water weevil (*Lissorhoptrus simplex*), however, does exist in overflowed fields.

The rice-stalk borer is the larva of a crambid moth (*Chilo plejadellus*). The moth lays its eggs in the early summer upon the rice stalks, and the young larvæ bore into the stalks, working their way gradually towards the roots. It transforms to the pupa stage within the stalk, and after five or six days the moth emerges. It is of a very pale yellowish or straw color, with golden fringes to the front wings, and expands about 1 inch. Stalks inhabited by the borer turn white, and this insect is responsible for a certain amount of the so-called white blast of rice fields. The chinch bug (q.v.) also feeds upon the rice heads, but is seldom abundant enough to do much damage; while in the periods between the overflows the grass worm (larvæ of *Laphygma frugiperda*), when occurring in large numbers, may ravage a field. See GRASS WORM.

Consult *United States Department of Agriculture, Annual Report* (Washington, 1881–82).

RICE INSTITUTE. An institution for higher education founded in 1912 in Houston, Tex. It bears the name of its founder, William Marsh Rice, who on his death left his entire property, valued at about $10,000,000, to the institute. A board of trustees for the foundation of the institute was incorporated as early as 1891, to establish a nonpolitical and nonsectarian institution, to be dedicated to the advancement of letters, science, and art. As a nucleus for an endowment fund Mr. Rice at this time gave $200,000 to the board of trustees. During the remainder of his life he increased this fund from time to time. Many years of litigation followed Mr. Rice's death in 1900, and the board of trustees was unable to begin active preparation for the opening of the institution till some time after. Edgar Odell Lovett, a professor in Princeton University, was chosen by the trustees as president of the new institute. In 1909 a campus of 300 acres was secured in Houston, 3 miles from the centre of the city, and in 1911 the corner stone of the administration building was laid. This building, the mechanical laboratory, the power house, and the first two wings of the residential hall for men, were ready for occupancy at the beginning of the first academic year. The courses of instruction are for the most part the same as at other colleges of the first rank, special attention being given to the sciences. The degree of A.B. is given for the usual courses. Courses are offered in chemical, electrical, and mechanical engineering. A complete course in any one of these departments will extend over five years. A course of architecture is also given. The institute is coeducational, and there were in all courses, in the autumn of 1915, 384 students. The instructors numbered 40. The endowment is practically $10,000,000. The valuation of grounds and buildings in 1915 was about $1,500,000, and the annual income about $500,000.

RICE LAKE. A city in Barron Co., Wis., about 50 miles (direct) northwest of Eau Claire, on Red Cedar River and on the Chicago and Northwestern and the Minneapolis, St. Paul, and Sault Ste. Marie railroads (Map: Wisconsin, B 3). It has a public library, the county normal school, and five large grade-school buildings.

Lumbering is the chief industry. Rice Lake has adopted the commission form of government. Pop., 1900, 3002; 1910, 3968.

RICH, Barnabe (?1540–1617). An Elizabethan writer. He served in the war with France (1557–58) and thereafter, through most of his life, with the army in Ireland. During his leisure he learned French and Italian and acquired a knowledge of the classics through translations. He claimed to have written 36 books, of which the best known is a series of short stories entitled *Riche his Farewell to Militarie Profession* (1581; reprinted by the Shakespeare Society, London, 1846). From this collection Shakespeare drew the plot of *Twelfth Night.* Afterward Rich issued many romances in the style of the *Euphues,* military reminiscences, and pamphlets against the Papists and tobacco. Consult J. A. A. J. Jusserand, *The English Novel in the Time of Shakespeare;* English translation by E. Lee (New York, 1890).

RICH, Claudius James (1787–1820). An English traveler and Orientalist, born at Dijon, France, of English parents. He was educated at Bristol, where he showed a remarkable aptitude for Oriental languages. Through friendly influence he received a cadetship in the East India Company service in 1803 and was ordered to proceed via Egypt as secretary to the Consul General to that country, but the vessel in which he traveled was burned in 1804 in the Gulf of Rosas, Spain. He managed to escape, and, after visiting Malta, Italy, Constantinople, Smyrna, and the interior of Asia Minor, everywhere familiarizing himself with the vernaculars, he spent some time in Egypt. Disguised as a Mameluke, he traveled through Palestine and Syria, and, sailing from Basra, reached Bombay in 1807. Four months later (Jan. 22, 1808) he married Governor Mackintosh's daughter and was appointed Resident at Bagdad, where he remained six years. After making a valuable collection of material for a history of the region, in 1811 he visited the site of Babylon, in 1813 sought recuperation from illness at Constantinople, and in 1814 journeyed through the Balkans and visited Vienna and Paris. After his return through Asia Minor to Bagdad, he revisited Babylon, and for his health traveled through Kurdistan in 1820. He definitely established the site of ancient Nineveh (q.v.). He is said to have died of cholera at Shiraz, in Persia, while assisting the sick. His published writings include the *Memoirs on the Ruins of Babylon* (1815; 3d ed., 1818); *Narrative of a Residence in Koordistan* (2 vols., 1836), edited with a biographical sketch by his widow; *Narrative of a Journey to the Site of Babylon in 1811* (1839). His Oriental collection was acquired by the British Museum.

RICH, Edmund. An archbishop of Canterbury. See Edmund, Saint.

RICH, John (1692–1761). An English harlequin and theatrical manager. His father, Christopher Rich, had been a manager of Drury Lane, and after the death of the elder Rich, in 1714, the son opened the new theatre in Lincoln's Inn Fields. It was in 1716 that he introduced the performances in which, under the name of Lun, he himself acted the part of Harlequin (q.v.). Before many years these had developed into the regular English pantomime (q.v.) and had become immensely popular. In 1732 he opened the theatre of Covent Garden, which he continued to manage till his death. Consult John Doran, *Annals of the English Stage from Betterton to Keane* (3 vols., London, 1887).

RICH, Penelope, Lady (c.1562–1607). The object of the poetic passion of Sir Philip Sidney's sonnets addressed to Stella. She was a daughter of the first Earl of Essex, who, together with his son Robert, Elizabeth's favorite, received kindly Sidney's offer of marriage. But her guardian, the Earl of Huntingdon, married her, probably in 1581, to Robert, second Baron Rich, apparently against her will. The sonnets in *Astrophel and Stella* (1591), published after this marriage, sneer at the husband's lack of worth and of ability to appreciate her worth—an attitude towards Lord Rich which is taken also by Richard Barnfield, Bartholomew Yonge, and others who wrote poetry to Lady Penelope. But her marital unhappiness did not stop at this stage. In 1595, at the latest, she had formed a liaison with Lord Mountjoy, to whom she bore three sons and two daughters and with whom, after Rich's abandonment of her, which did not occur until after the execution of her brother Robert (1601), she lived openly, even before her divorce in 1605. After her husband's remarriage she married Mountjoy, then Earl of Devonshire, and thus lost her standing at court, where she had been a great favorite.

RICH, Robert. See Warwick, Earl of.

RICH'ARD I (1157–99), surnamed Cœur de Lion, or The Lion-Hearted. King of England from 1189 to 1199. He was the third son of Henry II and his Queen, Eleanor, and was born at Oxford, Sept. 8, 1157. When a mere infant it was decided that he should inherit Aquitaine, and he was betrothed to Alice, or Alicia, the youngest daughter of Louis VII, King of France. Like his brothers, Richard on several occasions rebelled against his father, King Henry II, and was the most prominent figure in the final rebellion, which hastened the death of that monarch. Since the eldest son of Henry II had died, in 1183, Richard succeeded to all the possessions of his father. He had taken the cross in 1187, on the news of the capture of Jerusalem by Saladin. Philip Augustus, King of France, had done likewise, and in 1190 both started on the Third Crusade. Richard, in order to prepare suitably for this Crusade, had borrowed and extorted money wherever possible. The administration of England during his absence was intrusted to William de Longchamp (q.v.), but the prelate was opposed by the King's brother, John Lackland, who gradually usurped the government of the country.

The Crusade proved a failure almost from the start, chiefly on account of the lack of harmony between the two kings. After various delays Richard reached Messina on Sept. 23, 1190. He tarried in Sicily more than half a year and betrothed his nephew Arthur to the infant daughter of King Tancred. The Sicilian throne was at that time claimed by the Emperor Henry VI, and the alliance with Tancred for this reason afterward turned out a very unlucky one for Richard. He fell out with the French King, refused to marry his sister Alice, and on April 10, 1191, sailed from Messina, carrying along with him Berengaria of Navarre, whom he married on May 12, 1191, in the island of Cyprus, where he halted on his way to Palestine. The prodigies of personal valor which he performed in the Holy Land have made the name of Richard the Lion-Hearted famous in romance. After Acre had been captured, on July 12, 1191, Richard executed 2700 prisoners of war because the payment of their ransom was delayed. (See CRUSADE.) He quarreled bitterly with Philip Augustus, who went home. After spending months in indecisive contests against Saladin, Richard finally made a truce by which Jerusalem was left in the hands of the Sultan. On Oct. 9, 1192, he set out on his return to England. As he was making his way through the dominions of Leopold, Duke of Austria, he was seized by that prince, who had been insulted by Richard while in the Holy Land, and was handed over to the Emperor Henry VI, who detained him as a captive.

John meanwhile ruled in England, and he and Philip of France had good reasons for wishing that Richard should never return to his kingdom. He was finally released, however, after paying a heavy ransom and agreeing to hold his Kingdom as a fief of the Empire. On March 13, 1194, he found himself once more in England. His brother, John, who had acted so treacherously towards him, he magnanimously forgave, but with Philip Augustus he made war, while he left the actual government to the able administrator Hubert Walter (q.v.). He was on the whole victorious in his war against France, but was killed by an arrow shot from the castle of Chaluz, which he was besieging, and died April 6, 1199. His character has generally been shown by modern historians in a very unfavorable light. Sismondi's words are often quoted: "A bad son, a bad brother, a bad husband, and a bad king." This estimate is somewhat unjust to Richard. He was extremely generous to John; there is no trustworthy evidence that he was a bad husband; as King he chose able ministers and left most of the ruling to them. But he did tax England heavily for his expeditions. He was a poet and well versed in the knightly accomplishments of his age. In the succeeding century he became the hero of many legendary tales, and he has always been viewed in popular literature as a hero of romance.

Bibliography. Kate Norgate, *England under the Angevin Kings* (2 vols., London, 1887); T. A. Archer, *Crusade of Richard I* (New York, 1889); Herman Bloch, *Forschungen zur Politik Kaiser Heinrich VI.* (Berlin, 1892); William Stubbs, *Constitutional History of England*, vol. i (6th ed., Oxford, 1897); Reinhold Röhricht, *Geschichte des Königreichs Jerusalem* (Innsbruck, 1898); Alexander Cartellieri, *Philipp II August* (3 vols., Leipzig, 1899–1910); J. H. Ramsay, *Angevin Empire* (London, 1903). Sir Walter Scott, in *Ivanhoe* and *The Talisman*, has used some of the best-known legends.

RICHARD II (1367–1400). King of England from 1377 to 1399. He was the second son of Edward the Black Prince and Joan of Kent and was born at Bordeaux on Jan. 6, 1367. Many miraculous stories arose in time concerning his birth, due chiefly to his subsequent unfortunate career. Richard's elder brother died in 1371, and his father in 1376, so that he was placed in the care of his uncle John of Gaunt (q.v.). On June 21, 1377, Edward III died and left to the infant King a country devastated by plague and a people oppressed by heavy taxes due to the war with France (q.v.). Parliament, which had obtained greater power in the last years of Edward III's reign, sought now to secure control of the government, but was opposed by John of Gaunt and his followers. In 1381 took place the Tyler Insurrection (q.v.), which was caused partly by an onerous capitation tax. The speedy suppression of this dangerous rising was due to a considerable extent to Richard's spirit and daring. In 1383 Richard was married to Anne of Bohemia, and in the same year the King began to seek the downfall of the great nobles, who controlled Parliament and prevented the development of the royal power. The next two years were occupied by a war with France, with which country Scotland was allied. For a while Richard conducted the war in Scotland in person, and Edinburgh was burned. In the absence of John of Gaunt in Spain, Richard's youngest uncle, the Duke of Gloucester, put himself at the head of affairs; an attempt which Richard made to free himself from control having been defeated, several of his counselors were put to death, which act was approved by the Parliament of 1388. In 1389, however, Richard by a coup d'état succeeded in throwing off the yoke. Gloucester, Warwick, and Arundel were deprived of their power. These three nobles, together with Henry, Earl of Derby, eldest son of John of Gaunt, and Thomas Mowbray, Earl of Nottingham, had been the nobles who had "appealed" or accused Richard's adherents in 1388. Hence they are known in history as the "lords appellant." In 1394 Richard went to Ireland and received the submission of the four "kings" of Meath, Thomond, Leinster, and Connaught.

The same year the Queen died, and in 1396 a marriage treaty was concluded between Richard and Isabella, infant daughter of King Charles VI of France. Gloucester disapproving of this marriage, which seems to have been unpopular, Richard caused him to be privately arrested and conveyed to Calais, where he either died or was murdered. On the meeting of Parliament the Earl of Warwick was banished and the Earl of Arundel beheaded. A misunderstanding having taken place between Henry, Duke of Hereford (formerly Earl of Derby), and Mowbray, Duke of Norfolk (formerly Earl of Nottingham), the King, desirous to be rid of both, sent the former into banishment for 10 years and the latter for life. But Hereford had been assiduously cultivating the popularity which his cousin had been as assiduously throwing away, and the result became apparent in 1399. On his return in that year from a military expedition in Ireland, Richard found that Bolingbroke (as Hereford was generally known) had in his absence landed in England, that he had placed himself at the head of a formidable army, and that the Duke of York had yielded and gone over to his side. The army which the King had with him in Ireland, also, no sooner landed than it almost entirely passed over to the invader. Meeting the conqueror at Flint Castle, Richard was carried captive in his train to London. On Sept. 30, 1399, he formally resigned his crown. On the following day the resignation was ratified by Parliament, and the crown conferred on Bolingbroke (who had assumed the title of Duke of Lancaster), who was henceforth known as Henry IV (q.v.). By order of the peers Richard was confined secretly in various castles. In the February following his resignation the nation was told that he was dead, and his body, or what was supposed to be it, was brought with much pomp from Pontefract Castle and shown to the people. There were rumors afterward of his being alive and in Scotland. It is probable that he was murdered about Feb. 14, 1400. Richard had ability, but was very extravagant, fond of pleasure, and subject to fits of passion. He had some taste for literature and was a patron of Gower, Froissart, and Chaucer. His reign is important on account of the development of the Privy Council (q.v.) and the active rôle played by Parliament. Furthermore it was during this reign that the work of Wiclif (q.v.) bore fruit in the rise of the Lollard (q.v.) movement. Consult: H. A. Wallon, *Richard II* (2 vols., Paris, 1864); William Stubbs, *Constitutional History*, vol. ii (6th ed., Oxford, 1897); C. W. C. Oman, *Political History of England*, vol. iv (New York, 1906); K. H. Vickers, *England in the Later Middle Ages* (ib., 1914).

RICHARD III (1452–85). King of England from 1483 to 1485. He was the youngest son of Richard, Duke of York, and was born at Fotheringay Castle on Oct. 2, 1452. His boyhood was passed amid the struggles of the Wars of the Roses, in which he experienced both imprisonment and exile. In 1461, after the accession of his brother Edward IV to the throne, he was made Duke of Gloucester, although but a lad of nine years, and throughout the Wars of the Roses he remained faithful to his brother, rendering him most valuable assistance. He rejected the overtures of Warwick and shared Edward's exile in 1470–71, and in the latter year he commanded the vanguard of the Yorkist's army at the final victories of Barnet and Tewkesbury. For all these services he was richly rewarded. In 1469 he was made High Constable of England and in 1478 Great Chamberlain, besides receiving numerous other grants and offices. He stood highest in the royal councils, proving a capable statesman, and in 1480–82 he conducted successful campaigns against the Scots, and as Warden of the West Marches he brought that country into such subjection that the Parliament of 1483 granted this office to him and his heirs forever.

Upon his death in the same year Edward IV left to Richard the care of his heir, Edward V, then but 13 years old, and the administration of his kingdom. Richard was at the time in the north, but before his arrival at London he was recognized by the royal council as Protector of the realm. He soon overthrew the unpopular party of the Woodvilles, the Queen's relatives, who aimed to control the government, and finally imprisoned Edward V and his younger brother. Parliament thereupon declared that he was the rightful King, on the ground that Edward IV's marriage with Elizabeth Woodville was illegal. A deputation of lords and commons presented these conclusions to Richard, who assumed the crown on June 26, 1483. After his accession the King courted popularity with considerable success. He made a royal progress through the midland and northern counties and was everywhere received with joy and loyalty. While Richard was thus engaged in the north, plots for the rescue of the captive princes were being hatched in the south. To end these conspiracies Richard about this time probably had his prisoners put to death, and the popular belief that he was responsible for their death cost him his crown and his life. The Duke of Buckingham, who was involved in these plots, thereupon planned a rebellion in favor of the Earl of Richmond, the Lancastrian claimant of the throne. A general uprising was planned for October 18, which was to extend throughout southern England and Wales, but the King's adherents repressed the insurrection in the south and cut the bridges over the Severn. The heavy autumn rains prevented Buckingham from crossing the river from the Welsh side, and the same storms frustrated the intended invasion by Richmond. Buckingham was taken prisoner and executed.

The remainder of Richard's brief reign was spent in preparations for the final struggle with Lancaster. By wise laws and politic acts he sought to win the affections of the people and by extensive military preparations to baffle the expected invasion. In order to unite the Yorkist party Richard intended to marry his son and heir to Elizabeth, the eldest daughter of Edward IV, and on the death of his son he proposed marrying her (his niece) himself, but was obliged to renounce this plan on account of popular opposition. On Aug. 7, 1485, the Earl of Richmond landed at Milford Haven and was joined by the Welsh chieftains in his advance on Shrewsbury. Richard hastened to meet him, and the hostile armies faced each other on Bosworth Field. When, however, Richard ordered the attack, he found his troops half-hearted, and the Stanleys, whom he had summoned to his aid from Lancashire, joined the enemy. The result was that Richard was defeated and slain (Aug. 22, 1485), and the Earl of Richmond became King of England as Henry VII.

There has been much discussion over the character of Richard III. The chroniclers of the following reign, from whom we have derived our knowledge of him, wrote to please the Tudors. They pictured him as a monster, both physically and morally, and the genius of Shakespeare has fixed this conception in the public mind. He is said to have been undersized and a hunchback, with his left shoulder lower than the right. His look was said by Polydore Vergil to be full of malice and deceit and by Sir Thomas More to be warlike and hard-favored. But contemporary portraits, of which several survive, show a thoughtful, anxious face and no trace of deformity. A hunchback could not have performed the feats of valor which he accomplished at Barnet, Tewkesbury, and Bosworth. But of his unscrupulous character there can be no doubt, although many of the accusations of his enemies are unfounded. He and his brother Clarence were said to have caused the death of Edward, the heir of the house of Lancaster, after the battle of Tewkesbury. But even if this be true there were many similar executions in the Wars of the Roses. There is nothing to prove that he caused the murder of Henry VI or had any part in the accusation and conviction of his brother Clarence. From all these deaths Edward IV, and not Richard, was chief beneficiary. The murder of his two nephews in the Tower was, however, quite generally ascribed to Richard's orders.

Bibliography. Important source material is to be found in Polydore Vergil, *Anglicæ Historiæ Libri XXVI* (Basel, 1534; Leyden, 1861); Sir Thomas More, *History of King Richard III* (Cambridge, 1833); and *Letters and Papers of the Reigns of Richard III and Henry VII*, edited by James Gairdner in the "Rolls Series" (London, 1861–63). The best modern account of his reign is by James Gairdner, *Life and Reign of Richard III* (Cambridge, 1898). For a defense of Richard's character, and especially from the charge of murdering the princes, see Sir C. R. Markham, *Richard III: His Life and Character* (London, 1906).

RICHARD II. An historical tragedy by Shakespeare, written probably in 1595 and entered on the *Stationers' Register* in 1597. Excepting the adapted plays on Henry VI, it is the earliest of the historical plays and the first printed. It was probably the play acted the night before Essex's rebellion in 1601. The suggestive deposition scene made it unpopular at court, and it was suppressed by the censorship, being first printed in the Fourth Quarto in 1608. Several older plays on Richard II had been written, but were not used by Shakespeare. The chief source of the tragedy was Holinshed's *Chronicle,* and its model was Marlowe's *Edward II.* Among the historical plays it stands as a prologue to the dramas of Henry IV and V.

RICHARD III. An historical tragedy by Shakespeare, written about 1595 and entered in the *Stationers' Register* in 1597, shortly after *Richard II.* An older play, *The True Tragedy of Richard III,* was published in 1594, but from this Shakespeare took only two lines. He followed the *Chronicle* (1577) of Holinshed, who took the sombre picture of Richard from Sir Thomas More's *History of Richard III.* Traces of a weaker hand can be detected, and it is supposed that Marlowe helped in the early part of the play, which was finished and later revised by Shakespeare. Historically it follows closely on Henry VI and completes the series dealing with the Wars of the Roses.

RICHARD, EARL OF CORNWALL (1209–72). King of the Romans (of Germany) from 1257 to 1272. He was the second son of King John of England by Isabella of Angoulême. In 1225 he was created Earl of Cornwall by his brother Henry III. In the same year he led a successful expedition into Gascony. In 1240 he went on a crusade, but accomplished little because hindered by lack of support from the military orders. He received many grants from the King at various times, and amassed enormous wealth, mainly through the possession of the tin mines of Cornwall, which gave him great power in political matters. In 1253 and 1254 he was Regent of England. (See HENRY III.) In 1257 Richard was elected by some of the German princes King of Germany, Alfonso X of Castile (q.v.) being elected by a rival party. Richard was crowned at Aix-la-Chapelle. He gradually won recognition throughout the Rhineland, but not elsewhere. In 1259 he was forced to return home to raise money, and took an oath to observe the Provisions of Oxford (q.v.). In the great struggle which took place between Henry III and his nobles, Richard at first acted the part of a mediator; subsequently, however, he took a decided part with his brother against the party which was headed by Simon de Montfort, and on May 14, 1264, he was taken prisoner by that leader at the battle of Lewes. Montfort shut him up in Kenilworth Castle, from which he was released after the battle of Evesham in 1265. The murder of his eldest son, Henry of Almaine, by the son of Simon de Montfort, hastened his death (April 2, 1272).

Bibliography. Ottokar Lorenz, *Deutsche Geschichte im 13. und 14. Jahrhundert,* vol. i (Vienna, 1863); F. W. Schirrmacher, *Die letzten Hohenstaufen* (Göttingen, 1871); Hermann Koch, *Richard von Cornwall, 1209–57* (Strassburg, 1888); Johann Kempff, *Geschichte des deutschen Reiches während des grossen Interregnums* (Wurzburg, 1893); H. W. C. Davis, *England under the Normans and Angevins* (New York, 1905); T. F. Tout, *History of England, 1216–1377* (id., 1905).

RICHARD, rē̍'shär', FRANÇOIS MARIE BENJAMIN, CARDINAL (1819–1908). A French Roman Catholic prelate, born at Nantes. He was educated at Saint-Sulpice, was ordained a priest in 1844, served as vicar-general of the diocese of Nantes in 1850–70, was consecrated Bishop of Belley in 1872, was made Coadjutor Bishop of Paris in 1875, became Archbishop of Paris in 1886, and received the cardinal's hat in 1889. He opposed the Church and State Separation Law of 1906, and he was nearly 90 when his archiepiscopal palace was claimed by the government. Cardinal Richard did his utmost to check the Modernist movement.

RICH'ARD, HENRY (1812–88). A Welsh politician and peace advocate. He studied at Highbury College, and from 1835 to 1850 was a Congregational minister in London. From 1848 to 1885 he was secretary of the Peace Society, and his efforts in behalf of the principle of arbitration earned him the name of the Apostle of Peace. After 1868 he was a member of Parliament for the Merthyr boroughs. There he was instrumental in bringing about election reforms and in carrying through a motion in favor of international arbitration in 1873. His publications include: *Defensive War* (1846; 2d ed., 1890); *The Kagosima Incident and our Intercourse with Japan* (1863; 2d ed., 1863); *Memoirs of Joseph Sturge* (1864); *Letters on the Social and Political Condition of the Principality of Wales* (1866; 2d ed., 1884); *The Recent Progress of International Arbitration* (1884).

RICHARD DE BU'RY. See BURY, RICHARD DE.

RICHARD OF CIRENCESTER (?1335–?1401). An early English chronicler. Little is known of his life. He was probably born about 1335, and in 1355 was a monk in the Benedictine monastery of St. Peter's, Westminster, where he spent his life, and died in 1400 or 1401. He devoted himself to the study of early British and Anglo-Saxon history and antiquities, and is said to have visited many libraries and ecclesiastical establishments in England in the prosecution of his investigations. In 1391 he obtained a license from his abbot to make a pilgrimage to Jerusalem. Richard's principal work is the *Speculum Historiale de Gestis Regum Angliæ,* in four books, covering the period 447–1066. It is a compilation and not very carefully done. Consult the edition from the copy in the public library, Cambridge, by Mayer in the *Rolls Series* (2 vols., London, 1863–69). A treatise on the ancient state of Great Britain, *Ricardus Corinensis de Situ Britanniæ* (Copenhagen, 1757), was long accepted as a genuine work of Richard, but is now conceded to have been a forgery by Charles Bertram (1723–65).

RICHARD OF SAINT VICTOR (?–?1173). A scholastic and mystical theologian, born in Scotland. He entered the cloister of the Augustinian canons of Saint-Victor, near Paris, under its first abbot, who died in 1155. There he was a pupil of the mystic Hugo of Saint-Victor (q.v.), and rose to be prior in 1162. His numerous writings, collected in Migne, *Patrologia Latina,* cxcvi, may be divided into exegetical (in which he follows the allegorical and mystical interpretation), dogmatic, and miscellaneous. In the second the masterpiece is the six books on the Trinity; in the third appear his letters. Consult: Kaulich, *Die Lehren des Hugo und Richard von Saint Victor* (Prague, 1864); J. B. Hauréau, *Histoire de la philosophie scholastique*

(Paris, 1872–80); and the literature under Mysticism.

RICHARDS, Ellen Henrietta (Swallow) (1842–1911). An American sanitary chemist, born at Dunstable, Mass. She graduated at Vassar in 1870 and then studied for three years at Massachusetts Institute of Technology, where from 1876 till her death she was an instructor, first in the woman's laboratory and after 1884 in the department of sanitary chemistry. At the same time she held various positions as chemist. She made special researches in oils, relative to spontaneous combustion and explosion. In 1875 she had married Robert Hallowell Richards (q.v.). Mrs. Richards wrote: *Chemistry of Cooking and Cleaning* (1882); *Food Materials and their Adulterations* (1886); *The Cost of Living* (1899); *Air, Water, and Food* (1900); *The Art of Right Living* (1905); *Sanitation in Daily Life* (1907); *Euthenics, the Science of Controllable Environment* (1910). Some of these went through several editions.

RICHARDS, Herbert Maule (1871–). An American botanist, brother of Theodore William Richards. Born at Germantown, Pa., he was educated at Harvard (S.B., 1891; S.D., 1895), studied at Leipzig in 1895–96, and traveled in China, Japan, Straits Settlements, and Malay Archipelago in 1899–1900. He served as an instructor at Radcliffe College in 1892–95 and 1897–98 and also at Harvard in 1897–98, and at Barnard College was tutor (1896–97), instructor (1898–1902), adjunct professor (1902–06), and professor of botany thereafter. Richards became associate editor of the *Bulletin* of the Torrey Botanical Club, of the *American Naturalist*, and of *Physiological Researches.* His investigations deal largely with the structure and development of algæ and fungi and with plant reactions.

RICHARDS, John Morgan (1841–). A business man and writer, born at Aurora, N. Y., but for most of his life a resident of England. He was engaged in various commercial enterprises in the United States until 1867, when he removed to London, becoming chairman of John Morgan Richards and Sons, Limited. From 1888 to 1905 he was the owner of the London *Academy.* His books are: *With John Bull and Jonathan* (2d ed., 1905); *Sixty Years of an American's Life in England and the United States* (1905); *Life and Letters of Mrs. Craigie (John Oliver Hobbes)* (1911).

RICHARDS, Joseph William (1864–). An American metallurgist, born at Oldbury, England. He graduated at Lehigh University in 1886, returned there, after courses in Heidelberg and Freiburg, as assistant professor of mineralogy and metallurgy; and became professor there in 1903. He was a member of the United States Assay Commission (1897) and became a prominent legal expert in chemical and metallurgical cases. In 1902–03 he served as the first president of the American Electrochemical Society. After 1907 he added to his duties at Lehigh those of professor of electrochemistry at the Franklin Institute. In 1915 he was appointed a member of the new United States Naval Advisory Board. He wrote *Aluminum* (1887; 3d ed., 1896); *Metallurgical Calculations* (3 vols., 1906–08); and translated from the Italian Federigo Giolitti's *Cementation of Iron and Steel* (1915).

RICHARDS, Laura Elizabeth (1850–). An American author, daughter of Samuel Gridley and Julia Ward Howe and sister of Henry Marion Howe (qq.v.). She was born in Boston and was married to Henry Richards in 1871. Her many writings, consisting largely of stories, juvenile and other, include: *Sketches and Scraps* (1881); *Captain January* (1890; 150th thousand, 1902); *Melody* (1893; 64th thousand, 1898); *When I was your Age* (1893); *Snow White* (1900); *The Merryweathers* (1904); *Letters and Journals of Samuel Gridley Howe* (2 vols., 1906–09); *The Wooing of Calvin Parks* (1908); *Florence Nightingale* (1909); *Aboard the Mary Sands* (1911); a volume on her father and mother, *Two Noble Lives* (1911); *The Little Master* (1913); *Three Minute Stories* (1914). In 1915 Mrs. Richards and her younger sister, Maud Howe Elliott, published *Julia Ward Howe.*

RICHARDS, Robert Hallowell (1844–). An American mining engineer, metallurgist, and educator, born at Gardiner, Me. In 1868, with the first class to leave the institution, he graduated from the Massachusetts Institute of Technology, and there he taught for 46 years, becoming professor of mineralogy and assaying in 1871, head of the department of mining engineering in 1873, and in 1884 professor also of metallurgy. He retired in 1914. The laboratories which he established at the Institute were the first of their kind in the world. Professor Richards invented a jet aspirator for chemical and physical laboratories and a prism for stadia surveying. But it was in the field of ore dressing that he became especially distinguished. He determined the curves of material settling in water, thereby establishing the fundamental principles of sorting ore by means of jigs and other machines. He invented separators for Lake Superior copper, Virginia iron, and three for ores of the western United States. Richards served as president of the American Institute of Mining Engineers in 1886. He is author of more than 100 monographs or articles, but his most notable work is a monumental treatise, *Ore Dressing* (4 vols., 1903–09). He published also *A Text Book of Ore Dressing* (1909). His wife was Ellen Henrietta Richards (q.v.).

RICHARDS, Theodore William (1868–). An American chemist, born in Germantown, Pa., a son of William Trost Richards. He was educated at Haverford College and at Harvard (A.B., 1886; Ph.D., 1888). After further study, with Nernst at Göttingen, with Ostwald at Leipzig, and at the Technical School in Dresden, he returned to Harvard, where he served as assistant professor of chemistry from 1894 to 1901 and thereafter as professor; he was also chairman of the chemical department in 1903–11 and director of the Wolcott Gibbs Memorial Laboratory after 1912. Richards redetermined with great precision the atomic weights of many of the chemical elements, measured the compressibilities of a number of elements and compounds, and rendered valuable experimental services in thermometry and especially in calorimetry. Among many high honors which came to him were the Nobel prize in chemistry for 1914 (in recognition of his work in atomic weights); the Davy medal of the Royal Society; a medal from the British Chemical Society (before which he was Faraday lecturer in 1911); the Willard Gibbs medal of the American Chemical Society and the presidency of this body in 1914–15; his selection as exchange professor to Berlin in 1907; and election to the National Academy of Sciences. He also received numerous honorary degrees from American universities, and abroad from Oxford, Cambridge, Manchester, Berlin, Prague (Royal Bohemian), and Christiania. Consult J. Koppel, *Eperimentelle Untersuchungen über Atomgewichte von Theodore William Richards* (Leipzig, 1909).

RICHARDS, Thomas Addison (1820–1900). An American landscape painter and illustrator, born in London. He came to the United States in 1831 with his parents and settled in Georgia, but removed to New York City in 1845, where he studied at the National Academy of Design. In 1858 he was made director of the Cooper Union School of Design for Women, and in 1867 became professor of art in the University of New York. He was elected a National Academician in 1851. Richards belonged to the Hudson River school. He is best known, however, for his landscape illustrations drawn on wood, the first of the kind in America. Among the works on travel and art for which he supplied text and drawings are: *Georgia Illustrated* (1842); *The Romance of American Landscape* (1854); *Pictures and Painters* (1870).

RICHARDS, William (1792–1847). An American missionary. He was born at Plainfield, Mass., graduated at Williams College in 1819, and at the Theological Seminary at Andover in 1822. In the same year he was sent as a missionary to the Sandwich Islands, and by the close of 1830 the native church numbered nearly 300 communicants. In 1838 Mr. Richards was released from mission work to become interpreter, translator, and chaplain to the King. He visited England and several other foreign courts as special ambassador to secure the acknowledgment of the independence of the islands. After his return in 1845 he became Minister of Public Instruction, having care of all schools, Catholic and Protestant, and occupying a seat in the King's Privy Council. Consult Sprague, *Annals of the American Pulpit* (New York, 1866).

RICHARDS, Sir William Buell (1815–89). A Canadian jurist. He was born in Brockville, Ontario, where he practiced law, after being called to the bar in 1837. He was elected a Reform (Liberal) member of the Canada Legislative Assembly in 1848 and was Attorney-General in the Hincks-Morin ministry from 1851 till 1853, when he was appointed a puisne judge of the Court of Common Pleas in Upper Canada. He was Chief Justice of that court in 1863–68, Chief Justice of Upper Canada in 1868–75, and first Chief Justice of the Supreme Court of Canada from its foundation in 1875 until his retirement in 1879. He was knighted in 1878.

RICHARDS, William Trost (1833–1905). An American landscape and marine painter, born in Philadelphia. He was a pupil of Weber in his native city, and afterward traveled and studied in Europe. He exhibited at the Royal Academy and the Salon and became an honorary member of the Academy of Design. Richards tried to introduce Pre-Raphaelite principles into American art, and his early landscapes are marred by too great insistence on detail. The marines, which he painted later, while equally accurate, are more harmonious and better constructed. His works include: "On the Coast of New Jersey" (1883), in the Corcoran Gallery, Washington; "The Bell Buoy," in the Pennsylvania Academy; "A Rocky Coast"; and 85 other water colors, in the Metropolitan Museum, New York.

RICH'ARDSON, Sir Benjamin Ward (1828–96). A British physician. He was born at Somerby, Leicestershire, and studied at Glasgow, receiving the degree of M.D. in 1854 at St. Andrews. After establishing himself in London he held several hospital positions and served on the staff of the College of Physicians. He was knighted in 1893. The *Journal of Public Health and Sanitary Review* was founded by him in 1862 and the *Asclepiad* (of which he was editor until his death) in 1885. Richardson contributed many articles to medical literature, especially on the subjects of hygiene, temperance, and the history of medicine. Among his works are: *Hygienic Treatment of Pulmonary Consumption* (1857); *The Cause of the Coagulation of the Blood* (1858), Astley Cooper prize essay; *On the Medical History and Treatment of Teeth* (1860); *For and Against Tobacco* (1865); *Health and Life* (1880); *The Field of Disease* (1883); *The Health of Nations* (1887); *Vita Medica* (1897). His *Disciples of Æsculapius* was published by his daughter, Mrs. George Martin, in 1900.

RICHARDSON, Charles Francis (1851–1913). An American literary critic and historian. He graduated at Dartmouth College in 1871, was on the editorial staff of the *Independent* (1872–78) and the *Sunday-School Times* (1878–80), editor of *Good Literature* (1880–82), and afterward until 1911 was professor of Anglo-Saxon and English language and literature in Dartmouth College. His books include: *A Primer of American Literature* (1878); *The Cross* (1879), a volume of poems; *The Choice of Books* (1881); *American Literature* (2 vols., 1887–88); *The End of the Beginning* (1896), a romance; *A Study of English Rhyme* (1909). In 1902 he edited the Arnheim edition of Poe's works.

RICHARDSON, Clifford (1856–). An American chemist, born at Worcester, Mass. He graduated at Harvard in 1877. He was assistant chemist in the United States Department of Agriculture in 1878–87, then for seven years inspector of asphalt and cement in the United States engineering department, superintendent for an asphalt company in New York in 1896–1900, and proprietor of the New York Testing Laboratory in 1900–10. Thenceforth he was a consulting expert on asphalt, bitumen, and cement. His publications include: *On American Cereals* (1883); *Adulterations of Condiments and Spices* (1887); *On the Nature and Origin of Asphalt* (1898); *The Constitution of Portland Cement* (1904); *The Modern Asphalt Pavement* (1905; 2d ed., 1908); *Asphalt Construction for Pavements and Highways* (1913).

RICHARDSON, Ernest Cushing (1860–). An American librarian and author, born at Woburn, Mass. He graduated at Amherst in 1880, pursued special courses at Washington and Jefferson College, and studied also at Hartford Theological Seminary. Here he taught and was librarian from 1883 until 1890, when he was appointed librarian at Princeton. He served as president of the American Library Association in 1904–05. His writings include: *Classification, Theoretical and Practical* (1901); *Writings on American History* (1902); *Some Old Egyptian Librarians* (1911); *The Begin-*

nings of Libraries (1914); *Biblical Libraries* (1914); and other works upon literary and theological subjects, besides numerous articles on library work.

RICHARDSON, HENRY HOBSON (1838–86). An American architect, born at Priestley's Point, St. James's Parish, La., Sept. 29, 1838. His mother was a granddaughter of Joseph Priestley (q.v.). He graduated at Harvard in 1859, traveled in Europe, studied architecture at the Beaux-Arts, during a portion of his course was employed in the offices of a government architect, and, having returned to the United States in 1865, he began the practice of his profession in 1866 as a member of the firm of Gambrill and Richardson of New York City. In 1875 he removed to Brookline, Mass. He was a member of the American Institute of Architects, of the American Academy of Arts and Sciences, of the Archæological Institute of America, and an honorary and corresponding member of the Royal Institute of British Architects. Among the more important structures designed by him are Trinity Church, Boston, voted by architects one of the 10 most notable buildings in the United States, and, also in Boston, the church known formerly as the Brattle Square Church (Unitarian) and now as the First Baptist, especially remarkable for a fine tower ornamented with a frieze of colossal sculptures; parts of the State Capitol at Albany, N. Y.; Sever and Austin halls, in Cambridge, Mass., for Harvard University; the Allegheny County buildings, at Pittsburgh, Pa.; the Chamber of Commerce, Cincinnati, Ohio; the library of the University of Vermont at Burlington; the public libraries of Woburn and Quincy in Massachusetts; and many notable private residences and commercial and public buildings in the Eastern States. He established the successful use in American architecture of the Romanesque styles of southern France, Auvergne in particular. Repose of manner and a mastery of carved detail and of effects of contrast are characteristic of his work. His distinguishing qualities are breadth, unity, strength, and simplicity; his principal defects an occasional carelessness of technique and a tendency towards an exaggerated expression of power by violent contrasts of treatment. His influence on architecture in the United States was very great, and his work was hailed as giving promise of the development of a distinctive American style. Such, indeed, it was for some years; but in spite of his imitators, his style was too personal to endure long after his death, and its influence declined before the powerful impression produced by the neoclassic buildings of the Columbian Exhibition at Chicago in 1893. In his Brookline workrooms he trained many students. Richardson died of a chronic malady at the age of 47 (April 27, 1886). Consult Mrs. Schuyler Van Rensselaer, *H. H. Richardson and his Works* (Boston, 1888). See Plate of BOSTON, Trinity Church.

RICHARDSON, JAMES (1806–51). An English traveler. See BARTH, HEINRICH; OVERWEG, ADOLF.

RICHARDSON, SIR JOHN (1787–1865). A British Arctic explorer and naturalist, born at Dumfries, Scotland. He studied medicine at Edinburgh, and, having entered the royal navy in 1807 as assistant surgeon, was present at the battle of Copenhagen. He served on the coast of Africa, on the Baltic and North Sea stations, in Canada, and in 1815 in Georgia. He was surgeon and naturalist to Sir John Franklin's (q.v.) polar expeditions of 1820–22 and 1825–27. In the latter journey he traced the continental coast line of America through 20 degrees of longitude and 2 degrees of latitude, discovered a new land and two straits, and did much scientific work. In 1846 Richardson was knighted. Appointed to command the search for Franklin, Richardson, accompanied by Dr. Rae, left Liverpool in March, 1848. After great hardships the party reached Fort Confidence on Great Bear Lake. Richardson spent the winter in scientific observations, and in 1849, leaving Dr. Rae in command, returned to England. The journal of this expedition was published as *An Arctic Searching Expedition* (1851). After 1855 Richardson devoted himself to literary work at Grasmere. Besides contributing largely to the accounts of Franklin's expeditions (1823 and 1828), he published *Fauna Boreali-Americana* (1829–37) and *The Polar Regions* (1861).

RICHARDSON, JOHN (1796–1852). A Canadian journalist and novelist. He was born near Niagara Falls, Ontario, served as a volunteer in the War of 1812, and was made prisoner at the battle of the Thames. After his liberation he joined the British army, went to England in 1815, afterward lived partly in Paris, fought in Spain in 1835 in behalf of the Queen Regent against the Carlists, and in 1838 returned to Canada as special correspondent of the London *Times*. In 1840–42 he edited (after founding) the *New Era* at Brockville, and the *Native Canadian* at Kingston he edited in 1843–45. He afterward lived in the United States, where he did newspaper work until his death. Among his publications are: *Wacousta: An Indian Tale* (1833); *Ecarté, or the Salons of Paris* (1834); *The Canadian Brothers* (1840); *War of 1812* (1842); *Eight Years in Canada* (1847); *Tecumseh* (1853).

RICHARDSON, MAURICE HOWE (1851–1912). An American surgeon, born at Athol, Mass., and educated at Harvard (A.B., 1873; M.D., 1877). He settled in Boston. In 1879 he joined the medical faculty of Harvard, becoming professor of clinical surgery in 1903 and Moseley professor of surgery in 1907. Richardson was a prolific writer and a noted surgeon.

RICHARDSON, OWEN WILLANS (1879–). An American physicist. Born at Dewsbury, England, he was educated at Trinity College, Cambridge (B.A., 1900; M.A., 1904), where he was a fellow in 1902–08, and studied also at the University of London (B.Sc., 1900; D.Sc., 1903). After 1906 he occupied the chair of physics at Princeton University. His discoveries in connection with the electronic and kinetic theories of matter are important. Richardson contributed many papers to the *Philosophical Magazine*, the *Physical Review*, and the *Transactions* of the Royal Society of London (of which body he was elected fellow in 1913). He is author of *Electron Theory of Matter* (1914).

RICHARDSON, RUFUS BYAM (1845–1914). An American classical scholar, born at Westford, Mass. He graduated from Yale College in 1869, studied in the Yale Divinity School (1869–72) and in Europe (1872–74), and received the degree of doctor of philosophy at Yale in 1878. Later he held the chairs of Greek at Indiana University (1880–82) and at

Dartmouth College (1892–93). From 1893 to 1903 he was director of the American School of Classical Studies at Athens; during this period he excavated the ancient gymnasium at Eretria and began the excavations at Corinth (qq.v.). For reports on these excavations, consult *American Journal of Archæology* (1892–1902). His publications include also an annotated edition of Æschines, *Oration against Ctesiphon* (1889); *Vacation Days in Greece* (1903); *History of Greek Sculpture* (1910).

RICHARDSON, Samuel (1689–1761). An English novelist, born in Derbyshire. His father was a joiner, who desired to educate his son for the Church; but this he could not afford, so at the age of 16, with such an education as a country school could furnish, the young man went to London, where he became apprentice to one John Wilde, a printer. In 1719 he started as a printer on his own account, first in Fleet Street and soon afterward in Salisbury Court, and, on finding his success assured, he married Martha, daughter of Allington Wilde—not Richardson's former master. In 1754 he became master of the Stationers' Company and in 1760 he purchased the half interest of the patent of King's printer. He died July 4, 1761.

Till he had turned 50 Richardson's relations with literature, except in the way of printing, were of the most slight and amateur kind; but in 1740, a year after two booksellers, Rivington and Osborne, had proposed to him that he should write a volume of familiar letters as patterns for youths and maidens in the country, Richardson surprised the world with his *Pamela,* which had instant and great success. Hughes may have given Richardson a hint for his *Pamela* in a story told in the *Spectator* (375). Its continuation, to which the author was stung by the issue of a pretended sequel, entitled *Pamela in High Life,* was, however, pronounced much inferior. *Pamela* suggested to Fielding his *Joseph Andrews,* originally conceived as a parody of Richardson's somewhat prudish moralities. The satire was not appreciated by Richardson, and he never forgave Fielding. In 1747–48 Richardson issued, in eight volumes, *The History of Clarissa Harlowe*—by common consent his masterpiece—a work which in its progress to completion aroused the most intense interest. His third and last great work, *The History of Sir Charles Grandison,* was published in 1753. As a whole this is less interesting, and in his representation of the life of the fashionable classes, of which he had no clear personal knowledge, the writer succeeds but indifferently.

Richardson's method of minute elaboration is somewhat wearisome. But there are singular sources of attraction in the depth and simplicity of Richardson's sentiment, his profound knowledge of the heart, and his mastery of elemental emotion, and in virtue of the overwhelming effects of pathos in which the interest of his *Clarissa* culminates, a place must be assigned him among the potent masters of genuine tragic passion. His specialty lies in subtle analysis of the feminine heart, and in this particular field he has hardly been surpassed. It seems to have been his instinct to cultivate a curious sort of passionless confidential intimacy with women: throughout life he was the centre of a circle of female friends and admirers, who came to him with their little delicate secrets, as to a kind of lay father confessor; and the fruits of his nice observation of them he has given us to the full in his novels. Richardson is thus the first outright psychologist in English prose fiction. He also created great character types, as Lovelace and Clarissa. His popularity was very great, both in England and on the Continent. He shaped the novel for a half century, and is still a force. Consult his works edited by Leslie Stephen (12 vols., London, 1883); and by W. L. Phelps with *Life* (19 vols., New York, 1901–02); also: *Compendium,* edited by Barbauld (6 vols., London, 1804); Texte, *Jean-Jacques Rousseau et le cosmopolitisme littéraire au XVIIIème siècle* (Paris, 1895), translated into English as *Jean Jacques Rousseau and the Cosmopolitan Spirit in Literature* (London, 1899); C. L. Thomson, *S. Richardson: A Biographical and Critical Study* (ib., 1900); Austin Dobson, *Richardson* (New York, 1902); Leslie Stephen, *Hours in a Library,* vol. i (ib., 1907). The chief authority for Richardson's life is Mrs. A. L. Barbauld's biography, which gives Richardson's *Correspondence* (6 vols., London, 1804). See Novel.

RICHARDSON, Tobias Gibson (1827–92). An American surgeon. Born at Louisville, Ky., he studied medicine under Samuel D. Gross and at the University of Louisiana, graduating M.D. in 1848. He was early connected with the University of Louisville as lecturer in anatomy, then moved to Philadelphia and later to New Orleans, where he held the chair of surgery from 1858 until his death. Well known as a practicing surgeon, he was the first successfully to extirpate the parotid gland (1851). In 1878 he served as president of the American Medical Association. Richardson published, among other works, *Elements of Human Anatomy* (1854; 2d ed., 1867). Consult *In Memory of T. G. Richardson* (New Orleans, 1893).

RICHARDSON, William Adams (1821–96). An American jurist, born at Tyngsboro, Mass. He graduated at Harvard in 1843 and was admitted to the bar in 1846. In 1855 he was appointed to revise the Massachusetts Statutes, and subsequently edited the annual supplements to the State General Statutes. In 1869 he became Assistant Secretary of the United States Treasury, in 1871 visited Europe as agent for the sale of the United States funded loan, and in 1873 became Secretary of the Treasury. In 1885 he was appointed Chief Justice of the Court of Claims, and at one time he was a professor in the Georgetown University Law School. He published: *The Banking Laws of Massachusetts* (1855); *Practical Information Concerning the Debt of the United States* (1872); *National Banking Laws* (1872); *History of the Court of Claims* (1882–85).

RICHARDT, rē′kärt, Christian Ernst (1831–92). A Danish poet and dramatist, born in Copenhagen, noted for deep and refined feeling and spiritual and patriotic fervor. He was a pastor from 1872 to 1892. His comedy *The Declaration* (1851) was followed by *Short Poems* (1861); *Pictures and Songs* (1874); *Fifty Poems* (1878); *King and Constable* (1878), a musical drama; *Spring and Autumn* (1884), poems; *Miscellaneous Poems* (1891). *The Holy Land* (1870; 3d ed., 1889) was the fruit of a trip to the Orient. His *Samlede Digte* (Collected Poems) were published in three volumes in 1895.

RICHE, Gaspard Clair François Marie. See Prony, G. C. F. M., Baron de.

RICHEBOURG, rė̂sh'bo͞or', Emile (1833–98). A French author, born at Meuvy. He went to Paris in 1850 and was encouraged to write verse by Béranger (q.v.). He became known as a *feuilletonist* and writer of many novels that show more fertility of imagination than literary distinction. Among them are: *Les contes enfantins* (1858); *Cœurs de femmes* (1864); *Les franctireurs de Paris* (1872); *L'Enfant du faubourg* (1876); *Un calvaire* (1880); *Les millions de M. Joramie* (1885). Richebourg wrote also two dramas, *Les nuits de la place royale* and *Un ménage à la mode.*

RICHELIEU, rė̄'shė̄-lo͞o' *or* -lyẽ'. A river of Canada (also called Chambly, St. John, and Sorel). It is the outlet of Lake Champlain and flows northward into Lake St. Peter, a widening of the St. Lawrence, at Sorel, and has a straight course of 80 miles, ranging from 1000 feet to 1½ miles in width, through a picturesque and historic country (Map: Quebec, G 6). It is navigable to Chambly, whence a canal to St. John avoids the rapids lying to the south.

RICHELIEU, Armand de Vignerot du Plessis. See Aiguillon, A. de V. du Plessis Richelieu, Duc d'.

RICHELIEU, rė̂sh'lyẽ', Armand Emmanuel du Plessis, Duke de (1766–1822). A French statesman, grandson of Marshal Richelieu (1696–1788), born in Paris and educated at the College of Plessis. He left France at the beginning of the Revolution, entered the Russian service, under Suvarov, and became lieutenant general. Alexander I made him Governor of Odessa in 1803, but after a brilliant administration there he returned to France in 1815 to form a new ministry under Louis XVIII. His influence with the allied powers enabled him to secure the withdrawal of their troops from France, and he was chief of cabinet until 1818, when he resigned on account of his unsuccessful attempt to change the electoral law, according to his promise to the powers. He was recalled in 1820, retired within two years, and died shortly afterward, the last of his name.

RICHELIEU, Armand Jean du Plessis, Duke de, Cardinal (1585–1642). An eminent French statesman, born in Paris, Sept. 5, 1585. He was educated for the army at the Collège de Navarre, but turned to the study of theology in order that he might succeed his elder brother as Bishop of Luçon. This he was able to do on the latter's retirement in 1606, and on April 16, 1607, the youthful prelate was consecrated at Rome in the presence of Pope Paul V. He devoted himself with earnestness to the work of his diocese and was successful as a preacher and administrator. As one of the representatives of the clergy at the States-General in 1614 he attracted the notice of the Queen mother, Maria de' Medici, was made one of the court almoners, and later, in 1616, entered the Royal Council as Secretary for War and Foreign Affairs. The overthrow of Concini and the party of the Queen mother and the rise of the royal favorite, De Luynes, to power, sent Richelieu temporarily back to his bishopric. Reconciled to her son, mainly through the diplomacy of Richelieu, after the death of De Luynes in 1621, Maria de' Medici obtained for the latter a cardinal's hat, and in 1624 he was recalled to the council. He soon became the chief Minister of State and retained that post until the end of his life—the real head of France in everything but name.

The new Minister's first important measure was the arrangement of a marriage between the King's sister, Henrietta Maria, and the Prince of Wales, afterward Charles I. This assured friendly relations with England. It was necessary for Richelieu to suppress the Huguenots as a political faction, to reduce the disturbing nobles to obedience, and to restore the prestige which France had won under Henry IV in the affairs of Europe. While carrying out the first of these objects he made alliances with and gave encouragement to the Dutch and German enemies of the Catholic house of Austria. He regarded the Protestants at home or abroad wholly with the eye of a statesman, and had no religious prejudices. As the power of the Cardinal increased Maria de' Medici became antagonistic. The King trusted him implicitly, but never liked him personally, and always was restive under the mastery of this greater mind. Richelieu's policy was directed towards a unified system of administration in France, and in foreign affairs his chief aim was to humble the power of the Austrian and Spanish Hapsburgs. Richelieu was instrumental in bringing Gustavus Adolphus (q.v.) into Germany, and during the later years of the Thirty Years' War France was an active ally of the Protestant cause in the field. (See Thirty Years' War.) In 1628 the rebellious Huguenots were put down and La Rochelle was taken after a siege of 15 months, during which Richelieu commanded in person with great ability. In Italy France combated Austria and Spain in the War of the Mantuan Succession (1628–31), and Richelieu's diplomacy secured the recognition of the claims of Charles of Nevers. The ill will of the court nobles whom Richelieu's influence had deprived of power over the weak King showed itself in frequent conspiracies against the Cardinal. Gaston of Orléans, brother of Louis XIII, played a leading part in these plots, which Richelieu punished relentlessly. The so-called conspiracy of Chalais ended in death for some of the leaders and imprisonment for others. A second great conspiracy, headed by the Queen mother, reached its crisis on Nov. 11, 1630, when Richelieu himself had almost given up the struggle. The King refused him an audience, but Louis having withdrawn to Versailles, the Cardinal succeeded in seeing him there, overcame the influence of his enemies, demonstrated his necessity to France, and irrevocably fixed his ascendancy. The day became known, from the discomfiture of the conspirators, as the day of dupes. In 1631 the Duke of Montmorency (q.v.) rose against the Cardinal, only to perish on the scaffold. In the last years of his life Richelieu crushed the rising of the Count of Soissons and defeated the conspiracy of Cinq-Mars (q.v.). The later administration of Richelieu formed an important epoch in the history of the constitution of France and in her foreign relations. By a succession of vigorous and effective measures he succeeded in breaking down the political power of the great families of France and making the King an absolute ruler. The policy of war against Austria and Spain vindicated itself in its ultimate results, which, however, Richelieu did not live to see.

There is no question but that Richelieu was unscrupulous in the means that he used. There is equally no question that he used these means with a singleness of purpose for what he believed to be the good of France and his King.

His policy was successful in developing the greatness and the power of France, but burdensome impositions were necessary to meet the enormous expenditures it entailed, and the unchecked absolutism that he fastened upon the country was in the long run a misfortune. The variety and scope of his talents were remarkable. His writings fill several volumes, and some of them have much merit. Of the later ones his *Testament politique* and his *Mémoires* are most important. He also indulged in lighter literary diversions and in the drama, but left nothing noteworthy. He was a liberal patron of literature, and to him France owes the founding of the French Academy. (See Institute of France.) The Palais Cardinal, later known as the Palais Royal, was his Paris residence. He was as capable a military commander as he was a churchman, a civil administrator, and a diplomat.

Bibliography. His *Mémoires sur la règne de Louis XIII*, in "Collection Petitot" (Paris, 1823 et seq.); *Lettres, instructions diplomatiques, etc.*, edited by Georges d'Avenal (8 vols., ib., 1853–77); *Mémoire d'Armand du Plessis de Richelieu*, edited by Armand Baschet (ib., 1880); also: Anaïs de Raucou (called Bazin), *Histoire de France sous Louis XIII* (4 vols., Paris, 1840); Jules Caillet, *L'Administration en France sous le ministère du cardinal de Richelieu* (new ed., 2 vols., ib., 1863); Aimé Martineau, *Le Cardinal de Richelieu* (ib., 1865); Leopold von Ranke, in *Französische Geschichte*, vols. ii, v (3d ed., Stuttgart, 1877–79); M. J. F. Topin, *Louis XII et Richelieu* (Paris, 1885); Gabriel Hanoteaux, *Histoire du cardinal de Richelieu* (ib., 1893); G. Fagniez, *Le père Joseph et Richelieu* (2 vols., ib., 1894); Georges d'Avenal, *Richelieu et la monarchie absolue* (2d ed., 4 vols., ib., 1895); Richard Lodge, *Richelieu* (London, 1896); J. B. Perkins, *Richelieu and the Growth of the French Power* (New York, 1900); J. F. Barrière, *Memoirs of the Duke de Richelieu* (ib., 1904); *Cambridge Modern History*, vol. iv (ib., 1906).

RICHELIEU, Louis François Armand du Plessis, Duke de Fronsac and Duke de (1696–1788). A marshal of France, born in Paris, a grandnephew of the great Cardinal. He took an active part in court intrigues and was comrade and assistant to Louis XV in his love affairs. As a soldier he distinguished himself at Fontenoy. He was made marshal in 1748, Governor of Guyenne in 1755, and won great renown in the taking of Port Mahon, Minorca, in 1756. He succeeded Marshal D'Estrées as commander in Hanover, where he enriched himself by pillage and permitted his troops to do the same. His later days, as his earlier, were occupied with the dissipations of the royal circle at Paris. He was a witty, if not a wise, man, and the friend and protector of Voltaire, but better known for his patronage of Du Barry and for his flippancy. His memoirs were edited by Soulavie in 1793, and he is prominent in most other memoirs of the period.

RICHEPIN, rĕ̇sh′păɴ′, Jean (1849–). A French poet, novelist, and dramatist. He was born at Médéah in Algeria, Feb. 4, 1849. For a while he was a sailor, and he served as a rifleman in the Franco-German War. He at first studied medicine and then entered the Ecole Normale in Paris. After an apprenticeship in journalism, fiction, and drama he published (1876) *La chanson des gueux*, for the frank immorality of which he was fined 500 francs and imprisoned one month. In prison he wrote *Les morts bizarres* (1877). Among his works are the poems *Les caresses* (1877), *Les blasphèmes* (1884), *La mer* (1886), *Mes paradis* (1893), *La bombarde* (1899); the novels *La Glu* (1881), *Braves gens* (1888), *Flamboche* (1895), *Contes espagnols* (1901), *L'Aile, roman des temps nouveaux* (1911); and the plays *Nana Sahib* (1882), *Monsieur Scapin* (1886), *Le flibustier* (1888), *Par le glaive* (1892), *Le chemineau* (1897, presented in New York as *The Harvesters* in 1904), *Don Quichotte* (1905), *La route d'émeraude* (1909). In 1905 appeared *Selections from Jean Richepin*, with introduction and notes by Cameron. Richepin is to be counted among the romantics. In the field of drama his work is especially notable. In 1908 he was elected to the French Academy.

RICHER, rē̇′shȧ′, Edmond (1560–1631). A French theologian, born at Chaource, Aube. He was made a doctor of theology by the Sorbonne, and taught belles-lettres, rhetoric, and philosophy in the college of Cardinal Lemoine, of which he became director in 1594. The following year, while also syndic of the Sorbonne, he came forward as the chief opponent of the Jesuits, who in their turn attacked his work *De Ecclesiastica et Politica Potestate* (1611), and he was forced to resign his academic offices. He was summoned to appear before the Inquisition at Rome, and was imprisoned on his return to Paris, but was released upon his retraction and became canon of Paris. He made his defense in *Historia Conciliorum Generalium* (1683) and *Histoire du syndicat de Richer* (1753), both published posthumously. He also wrote *De Analogia, Causis Eloquentiæ et Linguæ Patriæ Locupletandæ Methodo* (1601), and other works.

RICHER, Paul (1849–). A French neurologist, born at Chartres. He was educated in Paris, from 1882 to 1895 was director of the laboratory connected with the Salpêtrière clinic of nervous diseases, and in 1898 was elected to the Academy of Medicine. In 1903 he became professor of anatomy at the Ecole des Beaux-Arts. He wrote *Etudes cliniques sur l'hystéro-épilepsie ou grande hysterie* (1881, crowned by the Institute; 2d ed., 1883, under the title *Etudes cliniques sur la grande hystérie ou hystéro-épilepsie*). But he is perhaps better known for his connection with art and anatomy. A pupil of Charcot and a draftsman of some ability, he published, in collaboration with his master, *Les demoniaques dans l'art* (1886) and *Les difformes et les malades dans l'art* (1889); and, alone, an *Anatomie artistique* (1890), which was crowned by the Academy of Fine Arts and by the Academy of Sciences; *Paralysies et contractures hystériques* (1892); *Physiologie artistique de l'homme en mouvement* (1895); *Nouvelle anatomie artistique du corps humain* (1906).

RICHET, rē̇′shȧ′, Alfred (1816–91). A French surgeon, born at Dijon. He studied in Paris and rose rapidly in his profession, became a member of the Academy of Medicine in 1865, did good service in the ambulance corps in the siege of Paris, in 1873 was made Commander of the Legion of Honor and in 1883 member of the Academy. Long professor of clinical surgery (1864–91), he wrote *Traité pratique d'anatomie médico-chirurgicale* (1857; 4th ed., 1873) and, among special treatises, *Leçons cliniques sur les fractures de la jambe* (1875).

RICHET, Charles Robert (1850–). A French physiologist, son of Alfred Richet. He was born and educated in Paris, was a prominent member of the French Biological Society after 1881, and received in 1879 a prize from the Institute for his monograph, *Propriétés chimiques et physiologiques du suc gastrique.* In 1887 he succeeded Béclard as professor of physiology in the medical faculty of the University of Paris, and in 1899 was chosen a member of the Academy of Medicine. Richet was awarded the Nobel prize in medicine for 1913. His works include: *La circulation du sang* (1879), a translation of Harvey on the circulation of the blood; *L'Homme et l'intelligence* (1884; 2d ed., 1887); *Essai de psychologie générale* (1888; 2d ed., 1891; Russ. trans., 1889; Pol., 1890); *Physiologie* (1893–1902); and, with others, a *Dictionnaire de physiologie* (1895–1906). Richet is best known for his research into the phenomenon which he called anaphylaxis (q.v.). This he had first explained with Portier in 1902. (See also Serum Therapy and consult his *L'Anaphylaxie*, 1911; Eng. trans., 1913.) He wrote besides on international peace and other subjects.

RICH'FIELD. A village in Hennepin Co., Minn., adjoining the city of Minneapolis on the north, on the Dan Patch Electric Line. It is purely a farming community and has fine greenhouses. Pop., 1910, 2673.

RICHFIELD. A city and the county seat of Sevier Co., Utah, 150 miles south of Salt Lake City, on the State Canal and on the Denver and Rio Grande Western Railroad (Map: Utah, B 4). It contains a Carnegie library, fine high and grade school buildings, a county courthouse, and the Sevier State Tabernacle (Mormon). Farming, dairying, and the raising of live stock, sheep, and sugar beets are carried on extensively, and there are sugar and plaster factories. Pop., 1900, 1969; 1910, 2559.

RICHFIELD SPRINGS. A village in Otsego Co., N. Y., 35 miles southeast of Utica, near Canadarago Lake, on the Delaware, Lackawanna, and Western and the Otsego and Herkimer railroads (Map: New York, E 5). There are mineral springs, frequented for their medicinal properties. Beautiful scenery and attractive drives are to be noted here. There are manufactures of milk products and knit goods. Settled in 1758, Richfield Springs began to be known as a resort in 1820. Pop., 1900, 1537; 1910, 1503; 1915 (state census), 1623.

RICH HILL. A city in Bates Co., Mo., 85 miles south by east of Kansas City, on the Missouri Pacific and the Kansas City, Fort Scott, and Memphis railroads (Map: Missouri, B 3). It is situated in the mineral belt of southwest Missouri, in the region noted for its extensive coal fields. Rich Hill carries on considerable trade in farm produce and live stock and has manufactories of vitrified brick and tile. Pop., 1900, 4053; 1910, 2755.

RICHLAND CENTER. A city and the county seat of Richland Co., Wis., 60 miles west of Madison, on the Chicago, Milwaukee, and St. Paul Railway (Map: Wisconsin, C 5). It is a trading centre, with manufactures of excelsior and other lumber products, condensed milk and cheese. There are a courthouse, city auditorium, and a Carnegie library. Pop., 1910, 2652.

RICH'MOND. A city of the State of Victoria, Australia, constituting a suburb of the city of Melbourne (q.v.). Pop., 1901, 37,722; 1911, 38,643.

RICHMOND. A town in Surrey, England, 8 miles west-southwest of London, on the right bank of the Thames (Map: England, F 5). It is a favorite summer resort for Londoners. The rich scenery of the vicinity is seen with advantage from the terrace, which stretches along the brow of the hill, on the slopes and summit of which the town is built. The banks of the Thames are studded with villas, and around the town are numerous nurseries and kitchen gardens. As Schene or Sheen, Richmond was a royal residence from the time of Edward I until the reign of James II. To the southeast of the town is Richmond Park, presented to the citizens of London by Charles I in 1634. Richmond was not incorporated until 1890, but had been favored with a progressive vestry which established a water supply, public baths, and a free library. The municipality has a fine town hall, artisans' dwellings, technical school, and isolation hospital. Pop., 1901, 31,672; 1911, 33,221. Consult *Victoria History of the County of Surrey*, vol. iii, edited by H. E. Malden (London, 1911).

RICHMOND. A town and the county seat of Richmond County, Quebec, Canada, on the St. Francis River and on the Grand Trunk Railway, 76 miles by rail east of Montreal (Map: Quebec, H 6). St. Francis College and a Roman Catholic convent are located here. The town has a variety of manufactures. It is connected with Melbourne by a free highway bridge. Pop., 1901, 2057; 1911, 2175.

RICHMOND. A city in Contra Costa Co., Cal., 8 miles by water from San Francisco, on the Atchison, Topeka, and Santa Fe and the Southern Pacific railroads. It has 6 miles of natural deep-water frontage on the western side of San Francisco Bay, and an inner harbor is being constructed (1915) at the southern side of the city. Richmond is the oil centre of the Pacific coast, the Standard pipe lines having their terminus here and the company's fleet of 60 vessels making this its home port. There is also here the largest refinery in the West. The Santa Fe system has large shops and yards, and the Pullman car shops are situated here. Other industrial establishments include pipe and steel works, extensive porcelain-ware and bathtub factories, one of the largest wineries in the world, a furniture factory, brickworks, foundries, machine works, stone quarries, and manufactories of carbon products, chemicals, novelties, matches, etc. The city's most prominent structures are the Carnegie library, splendid school buildings, and the new city hall. Richmond's growth has been unusually rapid, the population in 1915 being locally estimated at 22,000. Pop., 1910 (U. S. census), 6802.

RICHMOND. A city and the county seat of Wayne Co., Ind., 69 miles east of Indianapolis, on the Whitewater River, here crossed by iron bridges, and on the Pittsburgh, Cincinnati, Chicago, and St. Louis, the Grand Rapids and Indiana, the Chesapeake and Ohio of Indiana, and the Ohio Electric railroads (Map: Indiana, H 5). It is the seat of Earlham College (Orthodox Friends), opened in 1847, and has the Morrison-Reeves Library (public) with 30,000 volumes, and the Richmond Law Library. The Eastern Indiana Hospital for the Insane is here, also Reid Memorial Hospital, and homes for orphans and for aged women. There are fine public school buildings. Glen Miller Park comprises about 135 acres. The yearly meeting of the Orthodox Friends of Indiana is held in Richmond. The city is the commercial centre of a fertile agricultural region, and is important also for its manufactures. The chief products include threshing machines, traction engines, grain drills, office furniture, lawn mowers, automobiles, caskets, kitchen cabinets, wire fence, ventilating appliances, underwear, gloves, pianos, flour, sawed lumber, etc. Pop., 1900, 18,226; 1910, 22,324; 1915 (U. S. est.), 24,314.

RICHMOND. A city and the county seat of Madison Co., Ky., 50 miles southeast of Frankfort, on the Louisville and Nashville Railroad (Map: Kentucky, F 4). It has Madison Female Institute and the Eastern Kentucky State Normal School. There are flouring and planing mills, railroad shops, and three tobacco warehouses. Farming, tobacco raising, and horse breeding are chiefly pursued. Pop., 1900, 4653; 1910, 5340.

RICHMOND. A city and the county seat of Ray Co., Mo., 45 miles east by north of Kansas City, on the Atchison, Topeka, and Santa Fe Railroad (Map: Missouri, C 2). It is situated in a region engaged in agriculture, cattle raising, and coal mining, and has flour and lumber products. Pop., 1900, 3478; 1910, 3664.

RICHMOND. The largest city of Virginia and a port of entry, the State capital and county seat of Henrico County, 116 miles south by west of Washington, D. C. (Map: Virginia, G 4). It is situated on the James River, 127 miles from the Atlantic Ocean, at the head of tidewater. The rapids here have a fall of 100 feet in 6 miles and furnish an immense water power. A canal extends around the rapids, but is not now navigable; it is used to supply water power for the city. Several bridges span the James, which flows through the city. There are steamship lines to Atlantic coast ports, and the railroad facilities comprise the Southern Railway, the Atlantic Coast Line, the Seaboard Air Line, the Chesapeake and Ohio, the Norfolk and Western, the Richmond, Fredericksburg, and Potomac, and other roads.

The site of Richmond is of great natural beauty. It is regularly laid out on a succession of low hills that rise from the banks of the James, the highest point reaching an altitude of 250 feet above the sea. The area is about 25 square miles. The parks and cemeteries of Richmond and its monuments are of especial interest. The public park system, with an aggregate of 639 acres, includes Joseph Bryan Park of 263 acres, the magnificent gift to the city of Mrs. Joseph Bryan and her five sons; William Byrd Park with 300 acres on the western bounds of the city; Monroe, Gamble's Hill, Jefferson, Marshall, and Chimborazo parks, besides the Capitol Square. Capitol Square, on Shockoe Hill in the heart of Richmond, is 12 acres in extent. Here is situated the State capitol (1785–96), modeled, at the suggestion of Thomas Jefferson, after the Maison Carrée at Nîmes. In the capitol are busts and portraits of many eminent men, including the celebrated marble statue of Washington by the French sculptor Houdon in the rotunda. There are also in the square the new State Library, used mainly as an office building, the Governor's mansion, and the old Bell house. Prominently placed on the grounds, near the capitol, is a splendid monument to Washington. Statues of Henry Clay and "Stonewall" Jackson by Hart and Foley respectively, and bronze statues of William Smith, the war governor, and of Kuniar McGuire, a distinguished surgeon, further adorn Capitol Square.

In Monroe Park are a statue of General Wickham and one of Joseph Bryan, widely known as a man of affairs and a philanthropist. Gamble's Hill Park is noteworthy for the splendid view it affords. It overlooks the famous Tredegar Ironworks and the river with the historic Belle Isle and other islands. On the hill, in Libby Hill Park, stands the Confederate Soldiers and Sailors Monument. This elevation commands a fine view of the James and its islands and bridges. In Chimborazo Park (29 acres) was a well-known Confederate hospital. A fine road leads from this park to the National Cemetery at Seven Pines, 5 miles southeast of the city. At the east end of the stately Monument Avenue, 160 feet wide, stands the statue of Gen. J. E. B. Stuart; farther on the statue of Gen. Robert E. Lee in Lee Circle. Several squares west of here stands the great Jefferson Davis Monument. The Jefferson Monument and the Howitzer Monument also are worthy of note. Hollywood Cemetery is the most interesting in Richmond. There lie many famous persons, as well as 18,000 Confederate soldiers, in honor of whom is a rough pyramidal monument of granite. Other cemeteries are Shockoe Hill, the oldest in Richmond, Riverview, Mount Calvary, and Oakwood, the last having several thousand Confederate graves. The National Cemetery contains 6553 graves, 5700 of unknown dead.

The city hall, facing Capitol Square on the north, is a handsome structure of granite with a tower 180 feet high. The Sacred Heart Cathedral (Roman Catholic), presented by Mr. and Mrs. Thomas F. Ryan, is the country's third finest cathedral. Other edifices are the Chamber of Commerce, State Penitentiary, Soldiers' Home, and the union depot of the Chesapeake and Ohio, the Southern, and the Seaboard Air Line. Among historic buildings are the Old Stone House, the oldest in Richmond; St. John's Church (1740); the White House of the Confederacy, now a repository for Confederate relics; General Lee's residence, the home of the State Historical Society; the Masonic Temple, dating from 1785; and Chief Justice Marshall's house. The Valentine Museum has more than 100,000 archæological specimens, many objects of historic interest, and an art collection. Richmond is the seat of Richmond College (q.v.), opened in 1832; Union Theological Seminary (Presbyterian), opened in 1812; and the Medical College of Virginia. The institutions for colored students include the Hartshorn Memorial College and Virginia Union University (Baptist), opened in 1899. The private schools of the city and the Mechanics' Institute are of very high reputation. The State Library, with nearly 100,000 volumes, is the largest in the city. Other important collections are the Rosemary Public Library, the State Law Library, and the Virginia Historical Society Library. The position which Richmond has long held in the medical world has brought about the establishment of a number of excellent hospitals, the Grace, the Memorial, the Stuart Circle, St. Luke's, the Johnston, Sillis, the Virginia, the St. Elizabeth, the Sheltering Arms, and others.

Richmond is an important industrial and commercial centre, with a great wholesale, jobbing, and retail trade. The jobbing trade in the year 1914 totaled about $80,000,000 and the retail trade about $34,000,000. Bank clearings for 1914 aggregated over $420,000,000. Plans are under way for deepening the channel of the James from Richmond to the sea, so as to provide a minimum depth of 22 feet at mean low tide. This improvement will add considerably to the commercial advantages of the city. As an industrial centre Richmond ranks first in the State, its tobacco and iron interests being of primary importance. It is one of the leading tobacco markets in the United States, the tobacco industry being represented by stemming and rehandling establishments and by manufactories of chewing and smoking tobacco, snuff, cigars, and cigarettes. The iron interests include foundries and machine shops, locomotive works, car-axle and railroad-spike works, and nail, horseshoe, and agricultural-implement works. Flour and fertilizers also are manufactured extensively. Other products are boxes, carriages and wagons, lumber (cedar, woodenware, hubs, and spokes, etc.), tin roofing, tin tags, baking powder, paper, twine, meat juice, trunks and bags, hats, etc. The various industries in the census year 1914 possessed $37,000,000 capital and the output was valued at $98,177,000.

The municipal government is vested in a mayor, serving four years, a bicameral council, and administrative officers and five commissioners (the administrative board). Richmond spends annually for maintenance and operation about $3,227,000, the chief items being: interest and redemption of debt, $833,335; the gas works, $402,384; schools, $713,035; the police department, $223,461; the fire department, $253,395; streets and sewers, $1,290,870; charitable institutions, $48,000. The actual income for the fiscal year 1915 was more than $5,000,000. The water works and the gas works are the property of the municipality. The gas plant cost $1,373,000 and now has 142 miles of mains. The waterworks system cost $4,192,000 and includes 191 miles of mains. There are two reservoirs with a storage capacity of 53,000,000 gallons and a daily pumping capacity of 32,000,000 gallons, and a settling-basin system with a holding capacity of 200,000,000 gallons. The net debt of the city in 1912 was about $9,129,327; the assessed valuation of real and personal property was $148,768,790.

The population of Richmond in 1800 was 5737; in 1850, 27,570; in 1870, 51,038; in 1880, 63,600; in 1890, 81,388; in 1900, 85,050; in 1910, 127,628.

In 1609 Capt. John Smith bought from the Indians a tract of land near the site of Richmond and founded a settlement which he called None Such. In 1645 Fort Charles was built in the vicinity, and near here in 1676 Nathaniel Bacon (q.v.) defeated the Indians in the battle of Bloody Run. By grants in 1675 and 1687 Col. William Byrd obtained possession of the land in this district, and in 1733 his son, Col. William Byrd, laid out a town which he named Richmond. In 1742 Richmond was incorporated. In St. John's Episcopal Church in 1775 Patrick Henry made his famous speech, closing with the words, "give me liberty or give me death." Richmond became the capital of the State in 1779, and in 1782 it was chartered as a city. On Jan. 5, 1781, a small English force under Gen. Benedict Arnold entered the place and destroyed all the warehouses and public buildings. In 1788 the convention which ratified the Federal Constitution for Virginia met in St. John's Church. The Virginia Resolutions of 1798–99 were passed at Richmond, and here, in 1861, Virginia formally adopted the Act of Secession. From May, 1861, to April, 1865, Richmond was the capital of the Confederacy, and as such was the objective point of the Federal forces, which fought 15 pitched battles and at least 20 skirmishes in the effort to capture it. On April 2, 1865, it was evacuated by the Confederates, who, by order of General Ewell, set fire to the warehouses and destroyed the greater part of the business portion of the city. The Federal forces entered the place on the day after its evacuation. Consult "Richmond since the War," in *Scribner's Monthly* (New York, 1877); Wood, *The Industries of Richmond* (Richmond, 1886); W. W. Henry, "Richmond," in L. P. Powell (ed.), *Historic Towns of the Southern States* (New York, 1900).

RICHMOND, Charles Alexander (1862–). An American university chancellor. He was born in New York, where he attended the city college for one year, and graduated from Princeton in 1883 and from the seminary there in 1888. Ordained to the Presbyterian ministry, he then held pastorates at Aurora, N. Y., in 1888–94, and at Albany, N. Y., from 1894 to 1909. Thereafter he was president of Union College and chancellor of Union University. Chancellor Richmond received the degree of D.D. from Hamilton College in 1904 and that of LL.D. from Rutgers College in 1909, from New York University in 1910, and from Princeton in 1915. He is author of *The Four Winds* (1902) and *Safeguards of American Democracy* (1913).

RICHMOND, Charles Lennox, third Duke of (1735–1806). An English diplomat and statesman. He was born in London and succeeded to the peerage on the death of his father, the second Duke, in 1750. He was educated at Westminster School, later proceeding to Leyden University, where he graduated in 1753. He entered the army, saw active service in France, and was mentioned for his bravery at the battle of Minden in 1759, where he served as colonel of his regiment. He was appointed a lord of the bedchamber in 1760, but, disagreeing with George III, resigned and joined the opposition ministry. In 1765 he was sent to Paris as Ambassador Extraordinary, became a Privy Councilor, and the following year was appointed Secretary of State for the South. He was a strong supporter of the American Colonies in their demands for redress of grievances; in 1770 he introduced conciliatory resolutions which were carried by a majority, and in 1775 during a debate on American affairs defended the attitude of the colonists, declaring that their resistance was "neither treason nor rebellion, but perfectly justifiable in every possible political and moral sense." In 1778 he moved the resolution for the withdrawal of the troops from America. In 1782 he received the appointment of master general of ordnance with a cabinet seat, and was created Knight of the Garter.

RICHMOND, Legh (1772–1827). An English writer and evangelical divine, born in Liverpool. He graduated at Trinity College, Cambridge (1794), and was curate of Brading and Yaverland in the Isle of Wight and after 1805 chaplain to the Lock Hospital, London, and rector of Turvey in Bedfordshire. He was an earnest evangelical preacher. Between 1809 and 1814 he contributed to the *Christian Guardian* three village tales, reprinted together in 1814 as *The Annals of the Poor.* Of one of these, *The Dairyman's Daughter*, 4,000,000 copies had been issued in 19 languages before 1849. Richmond published also *Fathers of the English Church* (1807–12). Consult the *Life* by T. S. Grimshaw (London, 1828; ed. by G. T. Bedell, Philadelphia, 1846) and T. Fry, *Domestic Portraiture* (London, 1833).

RICHMOND, Sir William Blake (1843–). An English historical and portrait painter. He was born in London and studied at the Royal Academy Schools. Originally a follower of Burne-Jones, after a visit to Italy he adopted the style of the classic genre made popular by Leighton and Alma-Tadema. His paintings include "Amor Vincit Omnia" and "An Audience in Athens" (1885, in the Birmingham Gallery). He was Slade Professor at Oxford from 1878 until 1883, became a Royal Academician in 1895, and was knighted in 1897. He designed and superintended the mosaic decoration of the interior of St. Paul's Cathedral, London, but is perhaps seen at his best in his fresh and delicate pictures of children.

RICHMOND COLLEGE. A corporate name which includes two coördinate colleges at Richmond, Va., Richmond College for men and Westhampton College for women. Richmond College was founded in 1832 and Westhampton College was opened in September, 1914, with the same standards of education and essentially the same curriculum and requirements for degrees. The two institutions are under one board of trustees and one president, but each institution has its separate dean. The same faculty of men give instruction in both. There are in addition several women instructors, who teach only in the college for women. The two institutions are strictly coördinate, each with its own institution, and not coeducational. Richmond College for men includes a college of liberal arts and a law school. The total number of students in attendance in the coördinate colleges in 1915 was 424. The faculty numbered 43. The productive funds in the same year amounted to $1,125,000. The value of the grounds and buildings was $1,250,000 and the annual income was about $110,000. The library contains about 25,000 volumes. The institution is under Baptist control. The president in 1915 was F. W. Boatwright, M.A., LL.D.

RICHTER, rĭk′tẽr, Aemilius Ludwig (1808–64). A German jurist, born at Stolpen, Saxony, and educated at Leipzig. His *Corpus Juris Canonici* (1833–39) led to his being appointed assistant professor of law in Leipzig, and subsequently he held the chair of Church law at Marburg and then at Berlin. He also served as councilor in chief of the consistory and Privy Councilor of the government. Richter is considered the founder of a new school of Church law—the so-called Berliner Kanonisten-Schule. His publications include: *Beiträge zur Kenntnis der Quellen des canonischen Rechts* (1834); *Canones et Decreta Concilii Tridentini* (1853); *Lehrbuch des katholischen und evangelischen Kirchenrechts* (1842; 8th ed., by Dove and Kahl, 1886), which is considered a most important contribution to Church law literature. Of the *Kritische Jahrbücher für deutsche Rechtswissenschaft,* which he founded in 1836, he was editor until 1848.

RICHTER, Eugen (1838–1906). A German politician, born in Düsseldorf and educated at Bonn, Heidelberg, and Berlin. In 1864 his election as burgomaster of Neuwied was not confirmed, because of his liberal views. He was elected to the North German Diet in 1867, to the Prussian House of Deputies in 1869, and in 1871 to the Reichstag, where he was a leader of the Progressists and later of the Liberals. Intensely individualistic, he attracted attention by his opposition to state control of railroads, increase of war budgets, an Imperial colonial policy, and protectionism. Richter's opposition to Bismarck was particularly bitter. His political attitude sometimes placed him in opposition to his own party, and the *Freisinnige Zeitung*, founded by him in 1885, was on many subjects, especially on social reform, in direct contradiction to the other papers of the party. He wrote: *Politisches A B C Buch* (1879; 10th ed., 1903); *Die Irrlehren der Sozialdemokratie* (1890); *Sozialdemokratische Zukunftsbilder* (1891; in English, 1892); *Jugenderinnerungen* (1892); *Im alten Reichstag, Erinnerungen* (1894).

RICHTER, Franz Xavier (1709–89). A German composer, born at Holleschau (Moravia), one of the most important of the Mannheim symphonists. (See Music, History of, *XIX*.) He joined the Mannheim Orchestra in 1747, and from 1769 till his death was musical director at the Strassburg Cathedral. He wrote an oratorio, *La Deposizione della Croce* (1748), 28 masses, numerous motets and psalms, 69 symphonies, and much chamber music.

RICHTER, Gustav (1823–84). A German figure and portrait painter, born in Berlin. He began his studies at the academy there under Eduard Holbein, then was a pupil of Cogniet in Paris, and studied in Rome until 1849. The technical qualities of his "Raising of Jairus's Daughter" (1856, National Gallery, Berlin), painted for King Frederick William IV, aroused great enthusiasm on its exhibition, but both this and a large oil painting, "Building of the Pyramids" (1859–72, Maximilianeum, Munich), ordered by the King of Bavaria, suffer from theatrical pathos. Recognizing the limitations of his talent, Richter confined himself thereafter to single figures and portraiture, in which he was more successful. The first of a series of portraits of aristocratic beauties was that of Princess Carolath (1872). Of several family groups, reflecting the artist's own domestic happiness, two called "Evviva!", the painter with his first-born, and "Maternal Happiness," the painter's wife (youngest daughter of Meyerbeer) with their second son, were among the gems of the exhibition in 1874. His maturest works combine thorough characterization with real pictorial qualities. Fine examples are: "Banker's Wife" (1876), Countess Károlyi (1878), and, best of all, the well-known ideal portrait of Queen Louise (1879, Cologne Museum). Mention should be made also of the portraits of Emperor William I (1876, 1877), Empress Augusta (1878), and General Count von Blumenthal (1883, unfinished, National Gallery, Berlin).

RICHTER, Hans (1843–1916). An Austrian musical conductor, born in Raab, Hungary, where his father was kapellmeister. In

1853 he became a chorister in the court chapel at Vienna and began his musical studies at the conservatory. From the year 1866 dated his intimacy with Wagner, who in 1868 secured him the appointment of chorus master at the Munich Opera. Two years later he conducted *Lohengrin* at Brussels, and from 1871 to 1875 served as kapellmeister at the Budapest National Theatre. He conducted the concerts of the Vienna Gesellschaft der Musikfreunde for several seasons, gave many important concerts, and in 1876 conducted the *Nibelungen* performances at Bayreuth. In 1877 he commenced the annual Richter concerts, in London, which were among the most important musical events of the season. In 1897 he settled in Manchester as conductor of the Symphony Orchestra, also conducting the Wagner performances at Covent Garden, London. In 1911 he returned to Vienna. He conducted also the Lower Rhenish festivals and many important English festivals. Oxford gave him an honorary degree.

RICHTER, Johann Paul Friedrich, usually called by the name he chose himself, Jean Paul (1763–1825). The most widely known of German humorists. He was born at Wunsiedel, a town in Upper Franconia, and spent the impressionable years of his boyhood in the country at Joditz and Schwarzerbach, going in 1779 to attend the Gymnasium at Hof. Soon his father died, leaving his wife and Jean Paul to be cared for by Jean Paul's grandparents at Hof. On their death the mother and son were penniless and had to make what shift they could while Jean Paul studied at the Gymnasium. In 1781 he went to Leipzig to study theology, but he soon fell under the influence of Rousseau and of English humorists and satirists. He had earlier begun to make a collection of jests and anecdotes. Finding no opening as a teacher, he turned to literature. The *Encomium Moriæ* of Erasmus set him to writing his *Lob der Dummheit*, but this book was not published till after his death. In his anonymously published *Grönländische Prozesse* (1783–84) he satirized authors, women, theologians, ancestral pride, etc., but his satire fell rather flat. Poverty soon drove him to flee from Leipzig to avoid his creditors (1784). The next years he spent in reading, hack writing, and desultory rambling. Then some parents were induced to trust him with the education of their children, and for nine years he practiced his original pedagogic theories, writing the while some clever satires, *Auswahl aus des Teufels Papieren* (1789), the more famous idyls *Schulmeister Wuz* (1793), *Quintus Fixlein* (1796; trans. by Carlyle, 1827), with its appendix, *Fälbels Reise* (1796), and the novels *Die unsichtbare Loge* (1793) and *Hesperus* (1794; trans., 1865). *Hesperus* attracted the attention of Charlotte von Kalb, who, in 1796, invited Richter to Weimar, where Goethe received him with cool politeness, as did Schiller at neighboring Jena, his influence being contrary to their own aspirations for a classical German literature. Herder's welcome was warm, and Charlotte von Kalb tendered her heart with her hand, Weimar society being in those days still "imperfectly monogamous."

In the first flush of his good fortune Richter wrote *Blumen-, Frucht- und Dornenstücke, oder Ehestand, Tod und Hochzeit des Armenadvokaten Siebenkäs* (1796–97; trans., 1844, 1871, 1877), said by Meredith to be the finest bit of humorous writing in German, and *Das Kampanerthal* (1797). He fascinated the Weimar ladies with his conversation and still more by his sympathetic listening smile. He returned to Hof, only to take wing for longer flights to Weimar, Leipzig, and Berlin, where he married Caroline Mayer (1801). After three years of wedded wandering he settled in Bayreuth. Here he passed the rest of his life, 21 years, in somewhat eccentric quiet. The rather unsuccessful novel *Titan* (1801–03), showing the influence of Goethe's *Wilhelm Meister,* had already appeared. The first fruit of Bayreuth was the uneven and unfinished *Flegeljahre* (1804–05), with passages of charming description, humorous satire, and delicate fancy that suggest Laurence Sterne. This is Richter's last work of pure imagination that one is not glad to forgive and forget. But in his last years he made valuable contributions to pedagogy in *Levana* (1807), to art in his *Vorschule der Aesthetik* (1804), and to politics in his *Dämmerungen für Deutschland* (1809) and *Fastenpredigten* (1810–12), continued with redoubled scorn in 1817. *Levana,* though disconnected and unfinished, was full of fruitful suggestion, especially in its portions dealing with the education of women. Goethe praised it warmly for "the boldest virtues, without the least excess." The *Aesthetik* is valuable chiefly for its keen analysis of humor and happy praise of wit. It closes with a glowing eulogy of Herder and is a fragmentary development of his theory. The political papers, the most virile and practical of Richter's works, were bold denunciations of Napoleon and the German sycophants, whereas those of 1817 held up to even more merited shame the German princes who mocked the promises by which they had regained power. Disease troubled the peace of Richter's last years. He traveled much, and might to advantage have written less. He died in Bayreuth, Nov. 14, 1825. An *Autobiography* appeared in 1826. Though once quite popular and prized by many good judges of literary work, Richter is difficult and therefore very little read, nor did he exert a lasting influence on German literature.

Richter's complete works were published in 60 volumes (Berlin, 1879); selected works by Freye and Berend, 8 volumes (Berlin, 1908–10); the selections in 6 volumes by P. Nerrlich in the Kürschner's *National-Literatur* (1884–87) are also good. Material for Richter's biography is to be found in the autobiographical *Wahrheit aus Jean Pauls Leben* (Breslau, 1826–33; continued by Otto and Förster); R. O. Spazier, *Biographischer Kommentar* (5 vols., Leipzig, 1833); *Correspondence of Richter with C. Otto* (Berlin, 1829–33); *Correspondence of Richter with his Wife and Otto,* edited by P. Nerrlich (Berlin, 1902); F. J. Schneider, *Jean Pauls Jugend* (ib., 1905). Of interest are: Thomas De Quincey, *Life of Richter* (London, 1845); selections from his writings by Lady Chatterton (ib., 1859); P. Nerrlich, *Jean Paul, sein Leben und seine Werke* (Berlin, 1889); Carlyle, *Miscellaneous Essays,* vols. i, iii (new ed., Boston, 1901), interesting, but not wholly trustworthy; Johann Volkelt, *Die Kunst des Individualisirens in den Dichtungen Jean Pauls* (Halle, 1902); Münch, *Jean Paul, der Verfasser der Levana* (Leipzig, 1907); Berend, *Jean Pauls Aesthetik* (Berlin, 1909).

RICHTER, Julius (1862–). A German theologian, born at Gross Ballerstedt, near Osterberg. He studied theology at the universities of Leipzig and Berlin and held several pastorates in the Province of Brandenburg. Later he became professor at Berlin and was vice chairman of the continuation committee of the Edinburgh World Missionary Conference. He founded and edited the *Evangelische Missionen* and became editor of the *Allgemeine Missions Zeitschrift* and of the *Jahrbücher der vereinigten deutschen Missionskonferenzen.* His writings include: *Indische Missionsgeschichte* (1906; Eng. trans., *History of Indian Missions,* 1908); *Allgemeine evangelische Missionsgeschichte* (1908; Eng. trans., *History of Protestant Missions in the Near East,* 1910); *Die Bedeutung der norddeutschen Missions Gesellschaft für das Missionsleben Deutschland* (1911); *Weltmission und theologische Arbeit* (1913); *Das deutsche Kolonialreich und die Mission* (1914).

RICHTER, Ludwig (1803–84). A German landscape painter, etcher, and draftsman, most important as an illustrator. He was born in Dresden, the son of the engraver Karl August Richter (1778–1848), who first instructed him. After his return from a sojourn in Rome (1823–26), he was appointed instructor in drawing at the porcelain factory in Meissen and in 1836 at the Dresden Academy, where he continued as professor from 1841 to 1877. The interest of his uneventful life centres within the circle of his art. As a painter Richter aimed at a thorough blending of the figure element with the landscape and may be judged by the following examples: "Harvest Procession in the Campagna" (1833) and three others in the Leipzig Museum; "Ferry at the Schreckenstein" (1836) and "Bridal Procession in Springtime" (1847), in the Dresden Gallery; "View in the Riesengebirge" (1839), in the National Gallery, Berlin. Among his 240 etchings are about 140 views in Saxony, others of Salzburg, Rome, and the Campagna. His individuality is most completely revealed in his 3000 or more drawings for woodcuts, of which art he was one of the most influential revivers. Of special charm are his illustrations for *The Vicar of Wakefield* (1841), for Musäus' *Volksmärchen* (1842) and for numerous other fairy tales, for the *Goethe Album* (1855), for Schiller's *Glocke* (1857), and those cyclical publications which reveal the most brilliant side of the artist's inexhaustible fancy, such as *Beschauliches und Erbauliches* (1851); *Kinderleben* (1852); *Fürs Haus* (1858–61); *Der gute Hirt* (1860); *Unser täglich Brot* (1866); *Bilder und Vignetten* (1874). Their great popularity is due to the sunny character of his art and to its *gemüt,* for the drawing is weak and generalized, though not untrue to nature. An eye disease put a stop to the practice of his art in 1874; he was pensioned in 1877, and died at Loschwitz, near Dresden. Consult his autobiography, *Lebenserinnerungen eines deutschen Malers,* edited by his son Heinrich (12th ed., Frankfort, 1905); the monographs by J. F. Hoff (Dresden, 1877), Johannes Erler (Leipzig, 1897), and V. Mohn (Bielefeld, 1898); Atkinson, in *Art Journal* (London, 1885); Lützow, *Die vervielfältigende Kunst der Gegenwart* (Vienna, 1886).

RICHTHOFEN, rĭkt′hō′fen, Ferdinand, Baron (1833–1905). A German traveler, geologist, and geographer, born at Karlsruhe in Silesia. He studied in Breslau and Berlin, traveled in eastern Asia and Oceanica (1860–68), and after a short stay in California explored Japan and China. In 1875 he was named professor of geography at Bonn, in 1883 at Leipzig, and in 1886 at Berlin. In 1902 he became director of the newly founded Institut für Meereskunde, in the German capital, and editor of its publications. For a number of years he was president of the *Gesellschaft für Erdkunde.* His chief works include: *Geognostische Beschreibung der Umgebung von Predazzo* (1860); *China* (1877–83); *Atlas von China* (1885); *Methoden der heutigen Geographie* (1886); *Schantung und seine Eingangspforte Kiautschou* (1898); *Ueber Gestaltung und Gliederung einer Grundlinie in der Morphologie Ostasiens* (1900); *Geomorphologische Studien aus Ostasien* (1901). In English he published: *The Comstock Lode* (1865); *Principles of the Natural System of Volcanic Rocks* (1867); *Letters to the Shanghai Chamber of Commerce* (1869–72).

RICH′WOOD. A town in Nicholas Co., W. Va., 150 miles south of Clarksburg, on the Cherry River and on the Baltimore and Ohio Railroad (Map: West Virginia, D 3). It contains two hospitals. There are lumber and paper mills and a tannery. Timber and coal abound in the vicinity. Pop., 1910, 3061.

RICIMER, rĭs′ĭ-mẽr (?–472). A Roman general of the Western Empire. His father was a Suevian chief and his mother a sister of Wallia, King of the Visigoths. He was brought up at the Roman court, rose rapidly in the army, and defeated the Vandals in a naval battle near Corsica and later in a land fight near Agrigentum (456). Soon after this he attacked Avitus, who had been proclaimed Emperor of the West, and defeated him at Piacenza. In 461 he deposed Majorianus and crowned Libius Severus, and, after managing the Empire himself during an interregnum of a year and a half, brought Anthemius to the throne (467). But in 471 he quarreled with Anthemius and, having meanwhile attacked and sacked Rome (472), he deposed the Emperor and installed Olybrius. About a month after this Ricimer died of the plague. He had been the real power in Italy for 16 years. Consult *Cambridge Medieval History,* vol. i (New York, 1911).

RICINUS, rĭs′ĭ-nŭs. See Castor Oil; Castor-Oil Plant.

RICK′AREES, or **ARICARAS,** ȧ-rē′kȧ-rȧz. See Arikara.

RICK′ERT, Heinrich (1863–). A German philosopher, born at Danzig. He was educated at the universities of Berlin, Zurich, and Strassburg. In 1891 he became a lecturer at Freiburg, where he was promoted to associate professor in 1894 and full professor of philosophy in 1896. According to William James, Rickert holds reality to be whatever agrees with truth, and truth to be that which is founded solely on our primal duty. His publications include: *Zur Lehre von der Definition* (1888); *Der Gegenstand der Erkenntniss* (1892; 3d ed., 1914); *Die Grenzen der naturwissenschaftlichen Begriffsbildung: eine logische Einleitung in die historischen Wissenschaften* (2 vols., 1896–1902; 2d ed., 1913); *Kulturwissenschaft und Naturwissenschaft* (1899; 2d ed., 1910); *Fichtes Atheismusstreit und der kantischen Philosophie* (1899); *Psychophysiologische Kausalität und psychophysiologische Parallellismus* (1900); *Geschichtsphilosophie* (1905; 2d ed., 1907); *Zwei Wege der Erkenntnistheorie* (1909); *Zur Begriff der Philosophie* (1910); *Die Eine, die Einheit, und der Eins* (1911);

Lebenswerte und Kulturwerte (1911); *Urteil und Urteilen* (1912); *Vom System des Wertes* (1913).

RICK'ETS, or **RACHITIS,** rȧ-kī'tĭs (from *wrick*, MDutch *wricken*, Dutch, LG. *wrikken*, to move to and fro). A disease of nutrition, the chief feature of which is an alteration in the growth of the bones by which they become enlarged at their extremities and so soft that they are bent and distorted by muscular action and the weight of the body. It is essentially a disease of children, occurring as a rule between the ages of one and two years. The causes are improper and insufficient food and bad hygienic surroundings. The faults of diet from which infants are likely to develop rickets are: (1) deficient quality of milk from ill health and malnutrition of the nursing mother or unduly prolonged lactation; (2) the substitution for the mother's milk of artificial foods which contain a high percentage of starch and too little fatty and proteid matter.

The symptoms develop gradually and almost imperceptibly. The child is restless at night, and during sleep perspires profusely about the head and neck. It is very sensitive to pressure upon the limbs, often screaming when merely touched. The muscles are soft and flabby, and gastric indigestion and intestinal disturbances set in, accompanied by swelling of the abdomen and colic. Characteristic and remarkable changes in the bones develop. The joints become thickened and nodules form at the junction of the ribs with the costal cartilages, constituting what is called the rosary or beading of the ribs. Defective ossification is also seen in the skull, where the fontanels are large and slow in closing. Dentition is delayed and irregular and the teeth are subject to early decay. As the disease progresses the bones grow softer and various deformities of the head, spine, limbs, chest, and pelvis are brought about by muscular contraction and the superincumbent weight of the body. The child becomes pigeon-breasted and bow-legged. (See LEG.) The nervous system may be seriously affected, and rickety children are peculiarly liable to convulsions and to a spasmodic affection of the larynx known as *laryngismus stridulus*.

Rickets is a recoverable disease in the sense that it does not directly cause death and the process of bone softening ceases after a time, although it may have produced permanent deformity. Rickety children are especially prone to severe attacks of bronchitis and bronchopneumonia, by which death is often brought about. The treatment is essentially hygienic and dietetic. The child should be suitably clothed and receive an abundant supply of fresh air and proper food. Starchy materials, for the digestion of which the infant's secretions are not yet prepared, should be excluded from the diet, and cow's milk, to which lime water and a little cream may be added, should constitute the sole food. As the infant approaches the second year, beef juice, chicken broth, or gravy may be added to the dietary, and at a later age a little meat, eggs, and custard may be given. The most valuable medicine is codliver oil, given two or three times a day after a meal, in doses proportioned to the child's age. Phosphorus, sirup of the iodide of iron, and preparations of lime such as the lactophosphate are also of value in certain cases. While the bones are soft walking should be discouraged. Deformities of the limbs remaining after the disease is cured may, if extreme, be remedied by surgical procedures.

RICK'ETTS, JAMES BREWERTON (1817–87). An American soldier, born in New York City. He graduated at West Point in 1839, and after receiving his commission as lieutenant of artillery served in the Mexican War. At the outbreak of the Civil War he participated in the defense of Washington and at Bull Run was wounded and taken prisoner. On his release in 1862 he returned to duty with the grade of brigadier general and took part in the second battle of Bull Run. Later he led a division in the northern Virginia, Maryland, and Richmond campaigns, and at Antietam lost a third of his troops. He participated in the Virginia campaign in the spring of 1864, but in July was ordered north to join in the defense of Washington, which was then threatened by General Early, and participated, under Sheridan, in the pursuit of Early through the Shenandoah valley. At Cedar Creek, where he commanded a corps, he received a wound which disabled him for the winter. He was brevetted major general in the regular army in 1865, and from July, 1865, until April, 1866, when he was mustered out of the volunteer service, he commanded a district in Virginia. In 1867 he was retired from the regular service with the rank of major general.

RICKETTS, PALMER CHAMBERLAINE (1856–). An American engineer and educator. He was born at Elkton, Md., and graduated C.E. in 1875 from Rensselaer Polytechnic Institute, where he was thenceforth instructor (1875–82), assistant professor (1882–84), and professor (1884) of technical mechanics, director (1892–1901), and president and director after 1901. In the meantime he served also as a consulting engineer to railroads and other corporations. Besides his contributions to the technical press Ricketts is author of a *History of Rensselaer Polytechnic Institute* (1895; 2d ed., rev., 1914).

RICK'MAN, THOMAS (1776–1841). An English architect and writer on architecture. He was professor of architecture in the Liverpool Academy, and is chiefly known from the fact that in his work, *Attempt to Discriminate the Styles of Architecture in England from the Conquest to the Reformation* (1817), he first gave to the periods of English mediæval architecture the names Norman, Early English, Decorated, and Perpendicular, which have been used ever since. He designed a large number of churches.

RICKSHA, RICKSHAW. See JINRIKISHA.

RICO, rē'kō, MARTIN (c.1850–1908). A Spanish landscape, marine, and figure painter, born in Madrid, where he was a pupil of Federico de Madrazo. He obtained a scholarship enabling him to study in Paris and in Rome, where he spent some time with Fortuny, who chiefly influenced him. While Rico's paintings possess some of his master's sparkle and brilliancy, they lack his richness and depth of color. Many of his best works in oil and water color are in galleries and private collections in America. They include: "Grand Canal, Venice," Metropolitan Museum, New York; "Banks of the Adige," Corcoran Gallery, Washington; "Gathering Oranges, Toledo," and four others in the Walters Gallery, Baltimore; "Plaza and Street, Toledo," Senator Clark's collection, New York.

RICOCHET, rĭk'ō-shā' (of uncertain etymology). In military fire tactics this term describes a method of gunfire in which the gun is fired at a low angle and the missile rebounds from the flat surface over which it is traveling. In shelter trenches, rifle pits, redoubts, and other field fortifications, rocks and stones are very carefully covered with earth to avoid the possibility of deflecting the enemy's fire. When spherical projectiles were used in naval guns they were allowed to strike short and ricochet rather than run any risk of going over the enemy, for spherical projectiles are not deflected laterally by striking the surface of water at a low angle nor do they tend to rise after ricochet. Rifled projectiles are sharply deflected upon striking water and they frequently rise from the water surface at an angle very much greater than the striking angle; consequently ricochet is avoided in modern gunfire. See Gunnery.

RICORD, rĭk′ord, or **RICARD,** rĭk′ard, John. An American lawyer who went to Hawaii in October, 1843, and the next year was appointed Attorney-General of the island kingdom. In 1845 the Hawaiian Legislature authorized him to draft a series of acts organizing the five executive departments of the government: Interior, Foreign Affairs, Finance, Public Instruction, and Attorney-General. It also adopted changes in the constitution of 1840 affecting the Privy Council and the judiciary, which he proposed. In 1846 and 1847 it accepted the statute laws that he drew up, and these continued until the revolution to be the basis of Hawaii's civil code. His services in shaping Hawaiian institutions during their formative period were very valuable. He left the islands in 1847.

RICORD, rē̆′kōr′, Philippe (1800–89). A French surgeon, born in Baltimore, Md. He went in 1820 to Paris, where he graduated in medicine in 1826. After practicing in the provinces he returned in 1828 to the capital, where for many years he was surgeon in chief to the hospital for venereal diseases and to the Hôpital du Midi. He won a world-wide reputation in his special field. For his suggestions on the cure of varicocele and on the operation of urethroplasty he received in 1842 one of the Montyon prizes. He also demonstrated the difference between gonorrhœa and syphilis. In 1862 he was appointed physician in ordinary to Prince Napoleon and in 1869 consulting surgeon to the Emperor. For his services in the ambulance corps during the siege of Paris he was made Grand Officer of the Legion of Honor in 1871. Among his numerous works are: *De l'emploi du speculum* (1833), in which he describes the speculum invented by him; *De la blennhorrhagie de la femme* (1834); *Du chancre* (1837); *Traité pratique des maladies vénériennes* (1838; 4th ed., 1866; Eng. trans., *A Practical Lecture on Venereal Diseases*, 1842; 13th ed., 1854); *Lettres sur la syphilis* (1851; 3d ed., 1863; Eng. trans., 1853); *Leçons sur le chancre* (1858; 2d ed., 1860; Eng. trans., 1859).

RIDDER, rĭd′ẽr, Herman (1851–1915). An American newspaper publisher. He was born and educated in New York City, his parents having been German immigrants. At the age of 11 he became an errand boy, was employed by a life-insurance company two years later, and in 1871 became an insurance agent. He established the *Katholisches Volksblatt* in 1878 and the *Catholic News* in 1886. Ridder became trustee, treasurer, and manager in 1890 and president in 1907 of the New York daily *Staats-Zeitung*, through the columns of which he conducted a pro-German campaign in the United States during the European War. In 1908 he was treasurer of the Democratic National Committee. He became a trustee of the Mutual Life Insurance Company and was a president of the American Newspaper Publishers' Association.

RID′DING, George (1828–1904). An English bishop and educator, born at Winchester College, of which his father was a fellow. He studied at Balliol College, Oxford (M.A., 1853), and in 1851 became a fellow of Exeter College, where he was a tutor in 1853–63. In the latter year he became second master at Winchester, and in 1867 succeeded his father-in-law, George Moberly, as head master. In 1884 Ridding was appointed the first Bishop of Southwell. His publications include: sermons, *The Revel and the Battle* (1897); *Litany of Remembrance* (1905); *Church and Commonwealth* (1906); *Church and State* (1912), the last three edited by his widow.

RID′DLE (AS. *rædels, rædelse*, from *rædan*, to counsel, interpret, read, Goth. *ga-rēdan*, OHG. *rātan*, Ger. *raten*, to counsel; perhaps connected with Lat. *reri*, to think, or with OChurch Slav. *raditi*, to be anxious, Skt. *rādh*, to be successful). The definition in obscure terms of a well-known object which the person addressed is required to name. In modern times the enigma usually makes a witticism or pun, but anciently it had a character more serious. The themes of riddles were often natural objects, like the sun, moon, wind, or rainbow, and the presentation had something of a mythologic character. Knowledge of this sort was considered to imply a measure of wisdom which was in accordance with the early inclination to express truth in a mystical manner rather than in straightforward and simple speech. Thus, Samson, in order to show his intelligence, propounded a riddle to the Philistines. Riddle guessing was often made to form a game, in which one side asked questions and the other side responded; and such contest might be the subject of wagers. According to mythology the stake was often life or honor. Such was the case in the riddle proposed by the Sphinx to Œdipus: "What is that which has four feet in the morning, two at noon, and three at night?" to which the answer was: "Man." Similarly in Old Norse poetry Odin enters into a riddling contest with the giant Vafthrudnir, in which the latter perishes. In the "Alvissmal" the prize of the contest is the daughter of the god Thor. Of these contests we have a survival in the English ballad of the elfin knight, where a maid saves herself from an evil spirit by guessing his riddles.

RIDDLE, Albert Gallatin (1816–1902). An American lawyer and author, born at Monson, Mass. He was taken by his parents in 1817 to Geauga Co., Ohio, where he was educated in the common schools. Admitted to the bar in 1840, he served in the State Legislature in 1848–49. In 1848 he called together the first convention of Free-Soilers in Ohio. In 1859 he defended the Oberlin slave rescuers, and in 1861–63 was in Congress as a Republican. In 1864 he removed to Washington, and was afterward engaged by the State Department to assist in prosecuting John H. Surratt for his part in the assassination of President Lincoln. In 1877 he was appointed law officer of the District of

Columbia. For a time Riddle was head of the law department at Howard University, Washington. He wrote several stories of early Ohio life, such as *Bart Ridgely* (1873) and *The Sugar-Makers of the West Woods* (1885); a *Life of Benjamin F. Wade; Recollections of War Times, 1860–65.*

RIDDLE, MATTHEW BROWN (1836–1916). An American theologian, born in Pittsburgh. After his graduation at Jefferson (now Washington and Jefferson) College, Pennsylvania, in 1852, he studied at the Western and New Brunswick theological seminaries until 1859 and then went to Heidelberg. He was adjunct professor of Greek in Jefferson College (1857–58), pastor of Dutch Reformed churches in New Jersey (1862–69), professor in Hartford Theological Seminary (1871–87), and professor of New Testament exegesis and then of New Testament criticism in the Western Theological Seminary, Allegheny, Pa. He was a member of the American Committee for New Testament Revision, was also a reviser of the Westminster Confession of Faith, prepared *Notes on the International Sunday-School Lessons* (1877–81), and did much editorial work.

RIDEAL, rī-dēl′, SAMUEL (1863–). An English chemist, born in Brixton. He was educated at Dulwich College, at the Royal School of Mines, and at University College, London, where he became assistant in the chemical laboratory and fellow in 1887. He became well known as an expert on water and sewage purification, a subject which he took in 1902 for the Cantor lectures, delivered before the Society of Arts. Rideal wrote: *Practical Organic Chemistry* (1889; 2d ed., 1898); *Disinfection and Disinfectants* (1895; 3d ed., 1904); *Water and its Purification* (1897; 2d ed., 1902); *Sewage and the Bacterial Purification of Sewage* (1900; 3d ed., 1906); *Glue and Glue Testing* (1900; 2d ed., 1914); *Water Supplies: Their Purification, Filtration, and Sterilization* (1914), with Eric K. Rideal.

RIDEAU, rē′dō′. A waterway formed by the lake, river, and canal of the same name in the Province of Ontario, Canada (Map: Ontario, J 4). The lake is situated from 42 to 60 miles south-southwest of Ottawa and is drained by the Rideau River, which falls into the Ottawa River at the city of Ottawa. The canal, built between 1826 and 1834 for military purposes, connects Ottawa with Kingston on Lake Ontario by way of the river and lake and by connections with Mud Lake and the Cataraqui River. It is 126¼ miles long, has a navigable depth of 4½ feet and 47 locks. Its importance has declined since the advent of railways.

RIDEING, rīd′ĭng, WILLIAM HENRY (1853–). An American journalist and writer, born in Liverpool, England. After coming to the United States in 1869 he was at various times on the staff of papers in Newark, Boston, Springfield, and New York. In 1881 he became associate editor of the *Youth's Companion.* In addition he was also editor of the London *Dramatic Notes* (1881–82) and from 1888 to 1899 associate and managing editor of the *North American Review.* His publications include: *A-Saddle in the Wild West* (1879); *Stray Moments with Thackeray* (1880); *Boys in the Mountains* (1882); *Boys Coastwise* (1884); *Thackeray's London* (1885); *The Boyhood of Living Authors* (1887; new ed., *The Boyhood of Famous Authors,* 1908); *In the Land of Lorna Doone* (1895); *At Hawarden with Mr. Gladstone and Other Transatlantic Experiences* (1896); *How Tyson Came Home* (1904); *Many Celebrities and a Few Others* (1911), reminiscences.

RIDER. An American political term denoting a legislative measure which, if left to stand alone, is likely to be rejected by the other branch of the Legislature or vetoed by the Executive, but in order to be carried through is attached to an appropriation or other bill whose enactment is assured. The practice is an encroachment upon the independence of the executive, especially in the case of the President, who is not allowed to veto parts of an appropriation bill. A rule of the United States House of Representatives in 1888–89 prohibited the tacking of riders to appropriation bills.

RIDGAWAY, rĭj′ȧ-wā, HENRY BASCOM (1830–95). An American Methodist Episcopal minister and educator, born in Talbot Co., Md., and educated at Dickinson College. After holding various pastorates he was appointed in 1882 professor in the Garrett Biblical Institute (Evanston, Ill.), of which he became president two years afterward. He published biographies of *Alfred Cookman* (1871); *Bishop Edmund S. Janes* (1882); *Bishop Beverly Waugh* (1883); *Bishop Matthew Simpson* (1885); also, *The Lord's Land* (1876).

RIDGE, MAJOR (c.1770–1839). A noted Cherokee chief, born at Hiwassee town, near the present Columbus, in east Tennessee. Having been formally initiated as a warrior at the age of 12, he took an active part in the border warfare along the Tennessee frontier. Shortly after 1794 he was elected to a seat in the tribal council. He opposed cessions of tribal territory in 1804 and 1805, and took a firm stand against the doctrines of the Shawano prophet, who preached resistance to the government. In the Creek War of 1813–14 he led a detachment of Cherokee volunteers to the aid of General Jackson and rendered effective service, whence he was called Major. Together with 19 others he signed the Treaty of New Echota, in 1835, which bound the entire Cherokee nation to remove beyond the Mississippi. The treaty was opposed by John Ross and by the entire Cherokee council, but notwithstanding repeated protest it was carried through, and the entire tribe was deported to the Indian Territory, losing nearly 4000 by death on the journey, which occupied all the winter of 1838–39. On June 22, 1839, a few months after their arrival, Major Ridge, his son John, and Elias Boudinot, three principal signers of the treaty, were killed at their homes by men sent for the purpose, in accordance with an old Cherokee law which fixed the death penalty for attempting to sell tribal lands without the consent of the entire nation.

RIDGE, WILLIAM PETT (c.1860–). An English novelist, born at Chatham, near Canterbury, and educated in the Birkbeck Institution. He is best known for his humorous stories of lower-class life. His books include: *A Clever Wife* (1895); *Secretary to Bayne, M. P.* (1897); *Mord Em'ly* (1898); *A Breaker of the Laws* (1900); *Lost Property* (1902); *The Wickhamses* (1906); *Thanks to Sanderson* (1911); *The Remington Sentence* (1913); *The Happy Recruit* (1914); *The Kennedy People* (1915).

RIDGE′FIELD. A town in Fairfield Co., Conn., 16 miles by rail south of Danbury, on the New York, New Haven, and Hartford Railroad (Map: Connecticut, B 4). It is essentially a residential place and summer resort, containing beautiful homes of many New Yorkers. There is a tablet commemorating the battle fought here between the Continental soldiers and a British marauding party in April, 1777. Pop., 1900, 2626; 1910, 3118.

RIDGE′WAY, William (1853–). A British archæologist. He was born in King's County, Ireland, and was educated at Trinity College, Dublin, and at Cambridge. In 1883 he accepted the chair of Greek at Queen's College, Cork, and in 1892 that of archæology at Cambridge, where he became a fellow of Gonville and Caius. He was Gifford lecturer in natural religion at Aberdeen (1909–11), Stokes lecturer in Irish archæology at Dublin (1909), Hermione lecturer in art at Dublin (1911), and president of the Royal Anthropological Institute (1908–10) and of the anthropological section of the British Association (1908). Among his varied and valuable writings are: *Origin of Metallic Currency and Weights Standards* (1892); *The Early Age of Greece* (1901), in which he argues that the Homeric Achæans came from central Europe, where the Iron age had dawned as early as 2000 B.C., and that the Homeric or Achæan period was later than the Mycenæan (or Pelasgian); *The Origin and Influence of the Thoroughbred Horse* (1905)—he believes it came from North Africa; *Who Were the Romans?* (1907), an attempt to prove the Sabine origin of the patricians; *The Oldest Irish Epic* (1907); *The Origin of Tragedy* (1910); *Minos the Destroyer* (1910).

RIDGE′WOOD. A village in Bergen Co., N. J., 5 miles northeast of Paterson and 22 miles northwest of New York, N. Y., on the Erie Railroad (Map: New Jersey, D 2). The village has good schools. It is wholly a residential place. Pop., 1900, 3298; 1910, 5416; 1915 (State census), 6729.

RIDG′WAY. A borough and the county seat of Elk Co., Pa., 119 miles east by south of Erie, on the Clarion River and on the Pennsylvania and the Buffalo, Rochester, and Pittsburgh railroads (Map: Pennsylvania, D 3). The courthouse and high school are noteworthy buildings. There are a public hospital and a fine Y. M. C. A. Ridgway is the centre of a lumbering district, and is interested chiefly in manufacturing leather, iron, clay, and lumber products, silk goods, railroad snow plows, dynamos, and machine tools. Coal and natural gas abound in the vicinity. Pop., 1900, 3515; 1910, 5408.

RIDGWAY, Robert (1850–). An American ornithologist, born at Mount Carmel, Ill. He was zoölogist on the United States geological exploration of the fortieth parallel, under Clarence King, in 1867–69. In 1880 he was appointed curator of the division of birds in the United States National Museum at Washington, and he became one of the founders and in 1898–1900 was president of the American Ornithologists' Union. He collaborated with Baird and Brewer in *A History of North American Birds* (3 vols., 1875) and in *The Water Birds of North America* (1884). His other publications include: *A Nomenclature of Colors for Naturalists* (1886); *A Manual of North American Birds* (1887; 2d ed., 1896); *The Birds of North and Middle America* (5 vols., 1901–11); *Color Standards and Color Nomenclature* (1912).

RIDING. See Horsemanship.

RID′ING (from Icel. *þriðjungr*, third part, from *þriði*, third, from *þrīr*, three; the loss of the initial *th* is due to the faulty division of *North-thriding*, *South-thriding* as *North-riding*, *South-riding*), or Trithing. A term applied to the administrative districts into which Yorkshire, England, is divided, termed respectively East, West, and North Riding. Other counties besides York had and still have subdivisions other than the common hundred. In Kent the hundreds are grouped together in lathes or lests, and in Sussex in rapes. Lincolnshire, England, and Long Island, in America, were formerly divided into ridings. Consult William Stubbs, *Constitutional History of England*, vol. i (6th ed., Oxford, 1897).

RIDINGER, rē′dĭng-ẽr, Johann Elias (1698–1767). A German animal draftsman, etcher, and painter. He was born at Ulm and studied there under Christoph Resch and Johann Falk and then under Rugendas in Augsburg, where he was appointed director of the academy in 1759. His hunting scenes and delineations of animals were in great demand. In them he displays imagination and profound knowledge of animals, but they are more interesting from the standpoint of natural history or the chase than from that of art. His oil paintings are very rare and he is best known through his drawings, etchings, and engravings, a complete list and description of which may be found in the artist's *Life* by Thienemann (with three supplements, Leipzig, 1856–76).

RID′LEY, Nicholas (c.1500–55). Bishop of London and one of the leading English reformers. He was educated at Pembroke Hall, Cambridge, at the Sorbonne, Paris, and at Louvain. He came under the notice of Archbishop Cranmer and received various appointments from him. After 1536, the year of the death of his uncle Robert, who had paid the expenses of his education and who was an orthodox Roman Catholic, Ridley openly espoused the reformed faith. By the end of the reign of Henry VIII he had renounced his belief in the doctrine of transubstantiation, and he influenced Cranmer in the same direction. He was named Bishop of Rochester in 1547. He took part in the depositions of Bishops Bonner and Gardiner, and himself became in 1550 Bonner's successor as Bishop of London. He also took part in the first revision of the Prayer Book in 1548, and assisted in drawing up the 41 articles, afterward reduced to 39. On the death of Edward VI he warmly espoused the cause of Lady Jane Grey (q.v.), but when this proved a speedy failure he was compelled to submit to Queen Mary. Ridley was at once committed to the Tower, and though every opportunity was given him to recant, he refused. In 1554 he was removed to Oxford for trial, found guilty in 1555 of the capital offense of heresy, and on Oct. 16, 1555, he was burnt at the stake, together with Latimer, in front of Balliol College. Ridley's *Works*, which are chiefly polemical, have been published, together with a *Life*, by Henry Christmas, for the Packer Society (London, 1841).

RID′PATH, John Clark (1841–1900). An American historian and educator, born in Putnam Co., Ind. He graduated in 1859 at Asbury (now De Pauw) University, where he became professor of English literature (1869), of belles-lettres and history (1871), and vice president (1881). He resigned in 1885. His writings consist largely of popular presentations of

American history. Revisions or later editions of two of his works appeared as *New Complete History of the United States* (12 vols., 1911) and *Ridpath's History of the World* (9 vols., 1913). He also published biographies of James Otis, James A. Garfield, and James G. Blaine, and wrote verse and monographs on monetary subjects, and he served as editor in chief of a *Library of Universal Literature* (25 vols., 1898).

RIEBECKITE, rē′bĕk-īt (named in honor of Emil *Riebeck*, a German traveler of the nineteenth century). One of the numerous varieties of amphibole. It is a sodium-iron silicate crystallizing in the monoclinic system, has a vitreous lustre, and is black in color. It occurs among the older rocks, such as granite and syenite, especially on the island of Socotra, in the Indian Ocean.

RIECKE, rēk′*e*, Eduard (1845–). A German physicist. He was born in Stuttgart, was educated at the Technical High School there, where he studied mining, and at Tübingen and Göttingen, where he devoted himself to mathematics and physics. He served as a lieutenant during the Franco-Prussian War and in 1871 became a docent and in 1873 professor of experimental physics at the University of Göttingen. He did important work in various fields of physics, particularly electricity, heat, and hydrodynamics, for which he received an honorary degree in science from Cambridge University. His great publication was his *Lehrbuch der Physik* (1896; 5th ed., 1912), of which there is a Japanese version. He was an editor of the *Physikalische Zeitschrift* (Leipzig, 1899 et seq.).

RIEDEL, rē′d*e*l, Karl (1827–88). A German musician. He was born at Kronenberg, near Elberfeld, studied at Krefeld with Karl Wilhelm, and entered the conservatory at Leipzig, in which he became a teacher of piano and theory. In 1854 he established a society for the performance of ancient Church music which became famous as the Riedel-Verein under his leadership and that of Kretschmar. Upon the death of Brendel, Riedel became president of the Allgemeiner deutscher Musikverein. His compositions, mostly chorales for male voices, are vigorous and original; but his real claim to fame rests on his gift of organization, his thoroughness, and especially his masterly editing of such old works as those of Prätorius, Schütz, Franck, and Eccard.

RIEDESEL, rė-dā′z*e*l, Friedrich Adolph, Baron (1738–1800). A German soldier in America, born at Lauterbach, Hesse. He studied at Marburg, served under Prince Ferdinand of Brunswick during the Seven Years' War, and in 1776 took command of 4000 Brunswick troops hired by Great Britain for service against the American Colonies. He landed at Quebec in June, joined Burgoyne's expedition, fought bravely at the first battle of Saratoga (Sept. 19, 1777), and surrendered with his commander (October 17). He remained a prisoner for over two years, together with his wife. He was exchanged in 1780, put in command of the British forces on Long Island, and returned to Germany in 1783. He was made a lieutenant general in 1787, and commanded the Brunswickers in Holland.—His wife, Friederike Charlotte Luise (1746–1808), left an interesting account of their American adventures. The *Memoirs, Letters, and Journals of Major-General Riedesel during his Residence in America* (Albany, 1868) and *Letters and Journals* by Lady Riedesel (ib., 1867), both translated and edited by Stone, are among the most valuable material for the history of Burgoyne's campaign.

RIEFSTAHL, rēf′stäl, Wilhelm (1827–88). A German landscape, genre, and architectural painter, born at Neustrelitz, Mecklenburg. He was a pupil of Wilhelm Schirmer at the Berlin Academy, and subsequently traveled in Rügen, Westphalia, the Rhine country, and Switzerland, whence he took the landscape settings for his genre scenes. These are rather ponderous, but are good in color and are conscientiously painted in a manner typically German. Good examples are: "Devotions of Passeier Shepherds in the Fields" (1864, gold medal, Berlin), "All Souls' Day at Bregenz" (1869), and "Child's Funeral," all in the National Gallery, Berlin, and "Wedding Procession in Bavarian Alps" (1866), in the Metropolitan Museum, New York. He also painted Italian scenes with architectural backgrounds, such as "Funeral Procession in Front of the Pantheon" (1871), Dresden Museum. Riefstahl was director of the Karlsruhe Art School (1875–77), and then removed to Munich.

RIEGER, rē′gĕr, Franz Ladislaus, Baron von (1818–1903). A Bohemian statesman, born at Semil and educated for the bar at Prague. He entered the government service. Prosecution for political ideas increased his popularity, and in 1848 seven districts elected him deputy. He became one of the leaders of the Slavic party in the Austrian Reichsrat. During the reactionary period which followed the revolution he took no further part of importance in politics until 1860. In the meantime he occupied himself with the pen as a political weapon, writing *Slaves d'Autriche* (1860), and with Kober founding the Bohemian encyclopædia, *Slownik naučny* (1859–74). In 1861, with his father-in-law, the historian Palacky, he became a leader of the Czech National party, both as a member of the Bohemian Diet and as a deputy to the Vienna Reichsrat. In 1863 he dictated the policy of abstention, by which the Reichsrat was left without a Czech representation, and he thenceforth led, with the aid of the Ultramontanes and Feudalists, the agitation for Bohemian autonomy. During the Taaffe régime, after the Czechs had reëntered the Reichsrat, Rieger supported the government and became the head of the Old Czechs. His conservatism alienated the more radical wing of the National party (Young Czechs), who gradually gained supremacy, both in the Bohemian Diet and the Austrian Reichsrat. In 1897 he was made Baron and called into the Austrian House of Peers.

RIEGER, Urban. See Rhegius, Urbanus.

RIEGO Y NÚÑEZ, rė-ā′gȯ ė nōō′nyȧth, Rafael del (1785–1823). A Spanish revolutionist, born at Oviedo in Asturias. He joined in the patriot movement against France which followed the usurpation of the Spanish throne by Joseph Bonaparte. Captured by the French, he was a prisoner until 1814, when he visited Germany and England. He was leader of the military insurrection which broke out in January, 1820, and which brought about the restoration of the Spanish constitution of 1812. He became field marshal and captain general of Aragon, and in 1823 was president of the Cortes. He ardently opposed French intervention, met the soldiers of the Holy Alliance at the head of the Army of Malaga, was wounded, taken prisoner, and handed over to the royal authorities. He was tried as a traitor and put to death at Madrid, Nov. 7, 1823. A hymn, written by Riego's fellow prisoner in France, Colonel Reart, of the Walloon Guards, but called the "Hymn of Riego," became a popular revolutionary song and is now one of the national anthems. Consult Riego, *Memoirs of Riego and his Family* (London, 1824), and Nard and Piral, *Vida militar y política de Riego* (Madrid, 1844).

RIEHL, rēl, Alois (1844–). A German philosopher, born at Bozen, Tirol. He studied at Vienna, Innsbruck, and Munich, and was appointed professor of philosophy at Graz in 1878. Afterward he held similar chairs at Freiburg, Kiel, and Halle. He belongs to the German group of positivists. Riehl is well known as a logician, as a critic of modern English logic, and as author of *Beiträge zur Logik* (1892; 2d ed., 1912). His philosophical criticism is to be found in *Der philosophische Kritizismus* (1876–87; 2d ed., 1908); *Moral und Dogma* (1871); *Ueber wissenschaftliche und nichtwissenschaftliche Philosophie* (1883); *Giordano Bruno* (1889; 2d ed., 1900); *Friedrich Nietzsche* (1897; 4th ed., 1905); *Zur Einführung in die Philosophie der Gegenwart* (1903; 2d ed., 1904); *Kultur der Gegenwart* (1906); *Fichtes Universitätsplan* (1910).

RIEHL, Wilhelm Heinrich (1823–97). A German historian of civilization and novelist, born at Biebrich and educated at Marburg, Tübingen, Bonn, and Giessen. In 1846 he entered journalism on the staff of the *Karlsruher Zeitung,* then founded the *Badischer Landtagsbote,* and after his election to the German National Assembly in 1848 edited the *Nassauische allgemeine Zeitung.* In 1854 he went to Munich as professor of economics, and five years afterward was transferred to a chair of history of literature. He is better known as the author of valuable works on the history of civilization and of novels and tales based on these same historical studies, but of much literary excellence, especially in the short story. Riehl's works include: *Naturgeschichte des Volkes* (1851–69; in many editions); *Die Pfälzer* (1857); *Kulturstudien aus drei Jahrhunderten* (1859; 5th ed., 1896); *Musikalische Charakterköpfe* (1853–77); *Aus der Ecke* (1875; 3d ed., 1890); *Lebensrätsel* (1888); *Religiöse Studien eines Weltkindes* (1894); and posthumously a romance, *Ein ganzer Mann* (1897).

RIEHM, rēm, Eduard Karl August (1830–88). A German Protestant theologian. He was born at Diersburg, Baden, studied at Heidelberg and Halle, and in 1853 became a vicar at Durlach. In the following year he was appointed garrison preacher at Mannheim. A lecturer at Heidelberg from 1858, he became professor there in 1861, and in the following year took up the same duties at Halle. His publications include: *Die Gesetzgebung Mosis im Lande Moab* (1854); *Der Lehrbegriff des Hebräerbriefs* (1858–59; 2d ed., 1867); *Die besondere Bedeutung des alten Testaments für die religiöse Erkenntnis* (1864); *Hermann Hupfeld* (1867); *Die messianische Weissagung* (1875; 2d ed., 1883; Eng. trans., 1890); *Der Begriff der Sühne im alten Testament* (1877); *Der biblische Schöpfungsbericht* (1881); *Zur Revision der Lutherbibel* (1882); *Handwörterbuch des biblischen Altertums* (2 vols., 1884; 2d ed., 1892–94); *Einleitung in das alte Testament* (1889); *Alttestamentliche Theologie* (1889).

RIEKA, rē-yä′kȧ. See Fiume.

RIEL, rē-ĕl′, Louis (1844–85). Leader of the so-called Riel's Rebellion in Canada. He was born at St. Boniface, Manitoba, Oct. 23, 1844, and was of Indian and French-Canadian descent. He is said to have been educated for the priesthood in a Roman Catholic seminary at Quebec, but he did not take orders. He first came into prominence as the leader of the rebellion that broke out in 1869. In that year upon the purchase of the Northwest Territory from the Hudson's Bay Company by the Canadian government the metis, or half-breeds, of that section became alarmed lest they should lose some of their rights and especially the title to their lands, and formed a council to insist upon their claims. Of this council Riel was secretary and John Bruce president; but Riel was the actual leader of the movement. On November 2 the malcontents refused to allow William McDougall, who had been appointed Lieutenant Governor, to enter the Territory, and on the same day Riel took possession of Fort Garry. The council then issued a proclamation to the settlers, calling upon them to send representatives to a convention, which on December 1 issued a Bill of Rights and later formed a provisional government, of which Riel became President. A considerable number of persons who opposed the new government were seized and imprisoned, and by Riel's order one of these, named Thomas Scott, was executed. Attempts at a peaceful settlement of the difficulties having failed, the Dominion government determined to put down the rebellion by force of arms. Accordingly in the summer of 1870 Colonel Wolseley (afterward Sir Garnet Wolseley, commander in chief of the British army) was dispatched with a force of about 1400 men to the seat of trouble. Finding resistance hopeless, with some of his associates Riel fled to the United States, where he remained for some time. In 1873 and again in 1874 his friends elected him to the Dominion Parliament for the district of Provencher, and in the latter year, despite the fact that a reward of $5000 had been offered for his capture, he attempted to take his seat, but was expelled, and in October a warrant of outlawry was issued against him. In 1877 he was confined for a time in a lunatic asylum in Quebec, but the next year he was again at large and is thought by some to have entered into a conspiracy with the Fenians for the conquest of the Northwest. Later he went to Montana, whence in 1884 he was invited by French half-breeds living near the forks of the Saskatchewan to come and assist them in forcing the government to settle their claims to certain land grants and to give them certain other rights. Riel accepted their invitation, and in the following March was made President of the provisional government, which was established at St. Laurent. Troops, however, were dispatched against the rebels, and the main stronghold at Batoche was taken by General Middleton. Riel himself was soon afterward captured, and in July was brought to trial at Regina for high treason. His lawyers pleaded in his defense that he was insane, and this plea was to a certain extent borne out by peculiar religious ideas that he had announced; but he was nevertheless condemned to death and on

Nov. 16, 1885, was hanged. Consult Alexander Begg, *History of the Red River Troubles* (Toronto, 1871), and id., *History of the Northwest* (ib., 1895).

RIEMANN, rē′mȧn, GEORG FRIEDRICH BERNHARD (1826–66). One of the foremost German mathematicians of the nineteenth century, particularly in the field of geometry. He was born at Breselenz, near Dannenberg, in Hanover. He studied mathematics at Göttingen and Berlin and received his doctor's degree at the former university in 1851, his thesis being a well-known contribution to the theory of functions, *Grundlagen für allgemeine Theorie der Funktionen einer veränderlichen complexen Grösse.* Three years later he was made privatdocent at Göttingen, then (1857) adjunct professor, and finally (1859), on the death of Dirichlet, full professor. His introduction of the notion of geometric order into the theory of Abelian functions and his invention of the surfaces which bear his name led to great and rapid advance in the function theory. To him is due also (1854) a new system of non-Euclidean geometry, ranking with that of Lobatchevsky and Bolyai (see GEOMETRY), a system which he made known in his thesis *Ueber die Hypothesen, welche der Geometrie zu Grunde liegen* (published posthumously, Leipzig, 1867). Riemann's writings, besides those already mentioned, are: *Vorlesungen über Schwere, Elektrizität und Magnetismus* (1876; 2d ed., 1880; both posthumous); *Partielle Differentialgleichungen* (1869; 4th ed., 1900–01; both posthumous); *Mechanik des Ohres; Elliptische Functionen, Vorlesungen mit Zusätzen* (1899); and his *Gesammelte mathematische Werke und wissenschaftlicher Nachlass,* edited by H. Weber and Dedekind (1876; 2d ed., 1892; Fr. trans., 1898). He also contributed several memoirs on surfaces, which were published in the *Annalen* and in *Crelle's Journal.* For the life of Riemann, consult his *Gesammelte mathematische Werke* (Leipzig, 1902) and Ernst Schering, *Bernhard Riemann, zum Gedächtniss* (Göttingen, 1867); for an elementary explanation of Riemann's surfaces, consult H. Durège, *Elements of the Theory of Functions,* English translation by Fisher and Schwatt (New York, 1901), and Gustav Holzmüller, *Einführung in die Theorie der isogonalen Verwandtschaften und der Conformal-Abbildungen* (Leipzig, 1882).

RIEMANN, HUGO (1849–). A German writer on music, born at Grossmehlra, near Sondershausen. He was educated in musical theory by Frankenberger and studied the piano with Barthel and Ratzenberger. He also studied law, philosophy, and history. After serving in the Franco-German War he entered the Leipzig Conservatory. Both as conductor and as teacher at Bielefeld he was notably active until 1878, when he became university lecturer on music at Leipzig. As the much desired appointment at the conservatory did not follow, he went to Bromberg in 1880 as teacher of music, and from 1881 to 1890 he was teacher at the Hamburg Conservatory. After a short period at the Sondershausen Conservatory he went in 1890 to the conservatory at Wiesbaden. Near the close of 1895 he returned to Leipzig as lecturer at the university. In 1901 he became professor and in 1908 director of the newly established Collegium Musicum. His activity in all fields of musical research was amazing, yet he was no mere compiler, but a profound original investigator, and in the field of harmony and phrasing a true reformer, whose ideas are now generally accepted. His *Musiklexicon,* first published in 1882 and revised every few years (8th ed., 1916), has been translated into every civilized language and is a standard authority. Among his other works the most important are: *Handbuch der Harmonielehre* (1887); *Geschichte der Musiktheorie im 9.–19. Jahrhundert* (1898); *Geschichte der Musik seit Beethoven* (1901); *Handbuch der Musikgeschichte* (4 vols., 1901–14); *Grosse Kompositionslehre* (3 vols., 1902–03). He edited numerous older works and modern piano works with phrasings according to his system.

RIEMENSCHNEIDER, rē′men-shnī′dẽr, TILMAN, called MEISTER DILL (TILL) (1468–1531). One of the chief German sculptors of the Renaissance. He was born at Osterode, in the Harz Mountains. It is not known where or under whom he studied, but his work certainly shows the influence of Schongauer and probably of Syrlin. In 1483 he appears at Würzburg as a journeyman carver, in 1485 as a citizen, in 1505–07 as city architect; in 1509 he was chosen one of the three members of the upper council and in 1520 burgomaster. During the religious troubles of the following years Riemenschneider was one of the leaders of the reforming element which sided with the peasants during the Peasant War. After the definite victory of the Bishop of Würzburg over the peasants in 1525 he was imprisoned, tortured on the rack, and expelled from the council, and from this time until his death in 1531 he lived in retirement. His principal works in stone include the monument to Eberhard of Grumbach, in the church of Rimpar (near Würzburg); "Adam and Eve" (1493), on the south portal of the Liebfrauenkirche at Würzburg, and the statues of Christ, John the Baptist, and the Apostles on the buttresses of the same church (1500–06); a madonna and the tomb of John Trithemius in the Neumünsterkirche (1493); the portrait statues of the Bishops Rudolf of Scheerenburg and Lorenz von Bibra in the cathedral. His masterpiece is the monument to the Emperor Henry II and his wife Kunigunde in Bamberg Cathedral (1495–1513). Other well-known works are the "Bewailing of the Body of Christ" (1508), a group in the church of Heidingsfeld, and his last work (1525), a high relief of the same subject in the church of Maidbrunn.

Outside of his native land Riemenschneider is most widely known for his wood carvings, many of which were executed after his designs by his numerous pupils and followers. This was particularly the case in his last years. Chief among them are a series of large altars with reliefs and figures: the altars of the San Grail and the Virgin in St. Jakob, Rothenburg, and two others in the Marienkapelle; those at Creglingen, Detwang, Heilbronn, and Bibra, in the National Museum, Munich, and the Germanic Museum, Nuremberg; besides a remarkable polychrome madonna in a rosary in the Pilgrims' Chapel near Volkach. In the Altman collection, Metropolitan Museum, New York, is his "Bust of a Young Man." Although Riemenschneider's art lacks virility and dramatic power, it nevertheless charms by its sincerity and spirituality. The figures are slender, with drooping shoulders and stooping attitudes; the costume is contemporary, with draperies and proportions not always correctly treated.

Bibliography. The best monograph on Riemenschneider is by Eduard Tönnies (Strassburg, 1900); others are by A. Weber (Würzburg, 1888) and Streit (Berlin, 1888), with heliotypes of all his works.

RIEMER, rē′mẽr, Friedrich Wilhelm (1774–1845). A German scholar and literary historian, born at Glatz. He studied theology and philology at Halle, was a tutor in the family of Wilhelm von Humboldt (1801–03), and then for nine years lived with Goethe as his literary assistant and his son's tutor. In 1812 he became professor at the Weimar Gymnasium, from 1814 to 1820 he was assistant librarian, and from 1837 to his death he was librarian in chief at Weimar. Riemer published some mediocre poetry and a Greek lexicon (1802–04), but is best known for his contributions to Goethe literature: *Mitteilungen über Goethe* (1841), his edition of Goethe's correspondence with Zelter (1833–34), and his own letters published in two volumes called *Briefe von und an Goethe* (1846) and in *Aus dem Goethehause* (1892, edited by Heitmüller).

RIENZI, rē̍-ĕn′zē̍, Cola di (c.1313–54). A Roman popular leader. He was born at Rome, son of a tavern keeper. Until his twentieth year he lived among the peasants of Anagni; then he returned to his native city, where he studied grammar and rhetoric and read the Latin classics. The assassination of his brother by a Roman noble finally determined him to deliver the city from the barons. He assumed the significant title of consul of orphans, widows, and the poor. In 1343 he was appointed by the heads of the Guelph party spokesman or orator of a deputation sent to the papal court at Avignon to beseech Clement VI to return to Rome in order to protect the citizens from the tyranny of their oppressors. Here he formed a close friendship with Petrarch, through whose assistance he obtained a favorable hearing from his Holiness, who appointed him notary to the city chamber. In April, 1344, Rienzi returned to Rome; but reform, he found, was impossible without revolution. During three years he loudly and openly menaced the nobles, who, thinking him mad, took no steps to crush him. At last on May 20, 1347, surrounded by 100 horsemen and accompanied by the Papal Legate, Rienzi delivered a magnificent discourse to a gathering of the people on the Capitol, and proposed a series of laws for the better government of the community, which were unanimously approved. The aristocratic Senators were quickly driven out of the city, and then Rienzi took the title of tribune of liberty, peace, and justice and chose the Papal Legate for his colleague.

Rienzi dispatched messengers to the various Italian states, requesting them to send deputies to Rome to consult for the general interests of the peninsula and to devise measures for its unification. These messengers were everywhere received with enthusiasm, and on Aug. 1, 1347, 200 deputies assembled in the Lateran Church, in Rome, where Rienzi declared that the choice of an Emperor of the Holy Roman Empire belonged to the Roman people, and summoned Louis the Bavarian and Charles of Luxemburg, who were then disputants for the dignity, to appear before him. The Pope was indignant at the transference of authority from himself to his subjects; the people groaned under the heavy taxes necessary to support the cost of Rienzi's government; and the barons gathered together their forces and renewed their devastations. After ineffectual resistance Rienzi resigned his functions and withdrew from Rome, in December, after but seven months of power. In the solitudes of the Neapolitan Apennines Rienzi joined an order of Franciscan hermits and spent nearly two years in exercises of piety and penitence. Ambition made him readily listen to a brother-monk who declared that Rienzi was destined, by the help of the Emperor Charles IV, at Prague, to introduce a new era of happiness into the world. Rienzi went at once to Prague and announced to the Emperor that in a year and a half a new hierarchy would be established in the Church and under a new Pope Charles would reign in the west and Rienzi in the east. Charles put the prophet in prison, and then informed the Pope of the matter. In July, 1351, Rienzi was transferred to Avignon, where proceedings were opened against him, and he was condemned to death in August, 1352, but his life was spared and the next two years were spent in easy confinement in the French papal city.

Meanwhile at Rome the great families were more factious, more anarchical, more desperately fond of spilling blood than ever; and at last Innocent VI sent Cardinal Albornoz to reestablish order. Since the Pope thought Rienzi might help to accomplish this purpose, Rienzi was released from prison and accompanied the Cardinal to Rome. In August, 1354, having borrowed money and raised a small body of soldiers, he made a sort of triumphal entry into Rome and was received with universal acclamations. But misfortune had debased his character; he abandoned himself to good living, and his once generous sentiments had given place to a hard, mistrustful, and cruel disposition. The barons refused to recognize his government and fortified themselves in their castles. The war against them necessitated the incurring of heavy expenses. In two months, Rienzi's rule becoming intolerable, an infuriated crowd surrounded him in the Capitol and put him to death. Consult: Felix Papencordt, *Cola di Rienzo und seine Zeit* (Hamburg, 1841); Auriac, *Etude historique sur Nicole Rienzo* (Amiens, 1885); Emmanuel Rodocanachi, *Cola di Rienzo* (Paris, 1888); Ferdinand Gregorovius, *History of the City of Rome in the Middle Ages,* vol. vi (Eng. trans. by A. Hamilton, London, 1898); Gabriele d'Annunzio, *La vita di Cola di Rienzo* (Milan, 1913).

RIENZI, der letzte der Tribunen. An opera by Richard Wagner (q.v.), first produced at Dresden, Oct. 20, 1842; in the United States, Feb. 5, 1886 (New York).

RIES, rēs, Heinrich (1871–). An American economic geologist, born in Brooklyn, N. Y. He was educated at Columbia University (Ph.B., 1892; Ph.D., 1896), where he was an assistant in mineralogy in 1896–97, and at the University of Berlin (1897–98). At Cornell he served as instructor (1898–1902), as assistant professor (1902–05), and thereafter as professor of economic geology, becoming head of the geological department in 1915. In 1915–16 he lectured at Columbia. He was also a member of juries of awards at various American expositions. Ries was a contributor to the *International Year Book* and to the New International Encyclo-

PÆDIA. His publications include: *Economic Geology of the United States* (1905; 3d ed., rev., 1911); *Clays of Texas* (1908); *Clays: Their Occurrence, Properties, and Uses* (1906; 2d ed., 1908); *History of Clay-Working Industry in the United States* (1909), with Henry Leighton; *Building Stones and Clay Products* (1912); *Engineering Geology* (1914; 2d ed., rev., 1915), with T. L. Watson; also numerous reports on clay published by the United States and New York State Geological Surveys and the Canadian Geological Survey.

RIESA, rē′zȧ. A town and railway centre in Saxony, on the Elbe, 33 miles by rail northwest of Dresden. A large bridge of iron and stone here spans the river (Map: Germany, E 3). The town has a public library and a municipal hospital and various special schools. The harbor is good and possesses ample shipping facilities, and Riesa is consequently the centre of important shipbuilding interests and of a large trade, including fish, oil, coal, lumber, grain, iron ore, etc. Sandstone, which is quarried extensively, is also shipped. There are rolling mills and many other manufactories. Pop., 1900, 13,477; 1905, 14,073; 1910, 15,300.

RIESE, rē′ze, Friedrich Alexander (1840–). A German classical scholar, born and educated at Frankfort-on-the-Main. He studied also at Erlangen, Bonn, and Berlin. After holding positions in various institutions he returned in 1869 to Frankfort, where he was a professor in the Gymnasium from 1871 to his retirement in 1901. Besides his excellent editions of Varro's *Satiræ Menippeæ* (1865), of the *Anthologia Latina* (1869–70; 2d ed., 1894), of Ovid (1871–77), of the *Historia Apollonii Regis Tyri* (1871; 2d ed., 1893), of Catullus (1884, with commentary), and of Phædrus (1885), he published a suggestive essay, *Idealisierung der Naturvölker des Nordens in den griechischen und römischen Litteraturen* (1875); two monographs on early German history, *Das Rheinland in der Römerzeit* (1889) and *Das rheinische Germanien in der antiken Litteratur* (1892); *Der Götterkultus im rheinischen Germanien* (1898); *Das rheinische Germanien in den antiken Inschriften* (1913).

RIESENER, rē′ze-nẽr, Johann Heinrich (1734–1806). A German cabinetmaker, born at München-Gladbach, Rhenish Prussia. Early in life he went to Paris and entered the workshop of Johann Franz Oeben (died 1766, a pupil of Boulle and protégé of Madame de Pompadour), after whose death he married his widow, carried on his business, and was received as master into the Paris guild in 1768. Specimens of Riesener's work, in the style of Louis XV, executed for the royal palaces, may be seen at Fontainebleau, Trianon, Compiègne, and in the Musée du Mobilier National, Paris, while the majority of it was sold abroad, particularly into England, in consequence of the Revolution.

RIESENGEBIRGE, rē′zen-ge-bẽr′ge (Ger., giant mountains). The highest range of the Sudetic Mountains (q.v.).

RIETI, rē-ā′tē. A town in the Province of Perugia, Italy, situated on the Velino, 45 miles northeast of Rome (Map: Italy, D 3). It is well built and surrounded by walls. The fifteenth-century cathedral has a monument by Thorvaldsen. There are an old castle, a bishop's seminary, a Gymnasium, a lyceum, a technical school, and a public library of 30,000 volumes. The chief trade is in wine, oil, and fruit. Rieti, the ancient Reate, was a noted city of the Sabines. Pop. (town), 1911, 14,145.

RIETSCHEL, rēch′el, Ernst (1804–61). An eminent German sculptor, founder of the Dresden school. He was born at Pulsnitz, Saxon Lusatia, and had severe struggles with poverty in his youth and during his early artistic training at the Dresden Academy. In 1826 he became the pupil of Rauch, in Berlin, assisting that master in the completion of various works, notably of the monument to King Max I at Munich in 1829. He studied in Italy (1830–31), and the following year was appointed professor at the academy in Dresden, where he resided until his death, Feb. 21, 1861.

Rietschel's first work of importance was the monument of King Frederick Augustus I (1829–39), in the Zwinger at Dresden, but simultaneously he worked on the 12 great reliefs of the "Principal Epochs of Civilization" (1835–38), in the Aula of Leipzig University. Next came the admirable group in high relief in the pediment of the Opera House in Berlin (1844), with the Muse of Music in the centre, and "The Christmas Angel," a beautiful relief, widely known through reproductions. His fully developed art is shown in the famous "Pietà" (1845) of the Friedenskirche at Potsdam. Among his best creations are the statues of Thaer, the agriculturist (1850), at Leipzig, and of Lessing (1853), at Brunswick, a classical example of realistic portrait sculpture. In 1852 he began the "Emblematic Sculptures" on the exterior of the Dresden Museum, the cornice of which he also adorned with statues of Pericles, Phidias, Giotto, Dürer, Holbein, and Goethe. In the meanwhile he also modeled the heroic-size Goethe-Schiller Monument (erected 1857) for Weimar and in 1857 the bust of Rauch, one of the best portrait busts of the century. This was followed by the quadriga (1860), with the figure of Brunonia, for the ducal palace at Brunswick, cast in copper by Howaldt, and the masterly statue of Weber at Dresden. For the Valhalla, Regensburg, he executed the busts of Luther, Elector Augustus II, and other busts and relief portraits. Of his last and most elaborate production, the Luther Monument at Worms, he was only able to finish the model for the whole and the figures of Luther and Wiclif, while the completion of his design was intrusted to his pupils Donndorf and Kietz (1868). Rietschel was the most important of Rauch's pupils. He united the strict classicism of that master with a more realistic conception, thus directing German sculpture in the paths it was to follow. A collection of casts and models of all his works is preserved in the Rietschel Museum at Dresden. Consult his *Autobiography,* edited and supplemented by Oppermann (Leipzig, 1873), and *Briefwechsel zwischen Rauch und Rietschel* (Berlin, 1890–91).

RIEZLER, rēts′lẽr, Sigmund, Knight von (1843–). A German historian, born in Munich. He was educated there, became a docent in 1869, and after 10 years as head of the archives and library of Donaueschingen was made librarian of the Royal Library in Munich in 1883 and director of the Maximilianeum in 1885. His works include: *Das Herzogtum Bayern zur Zeit Heinrichs des Löwen und Ottos I.* (1867), with Heigel; *Der Kreuzzug Kaiser Friedrichs I.* (1870); the great *Geschichte Bayerns* (1878–1903); *Die bayrische Politik im Schmalkaldischen Kriege* (1895); *Geschichte der Hexen-*

prozesse in Bayern (1896); *Nachtselden und Jägergeld* (1905); *Studien zur älteren Geschichte Münchens* (1907); *Ortsnamen des Berchtesgadener Landes* (1913).

RIFF, THE (Er Rif). A name given to the mountain region bordering the north coast of Morocco from Ceuta eastward nearly to the borders of Algeria and included in the Atlas system. The rugged coast, the principal projection of which is Cape Tres Forcas, is almost without harbors. The inhabitants are pure Berbers in blood. In the French conquest of Algeria they were not molested, and they are said to live in a state of chronic revolt against the Sultan of Morocco. They were formerly noted for piracy. The people understand or speak Arabic only to a very slight extent, Shleh or Shluh being their native tongue. They are said to be untrustworthy.

RIFLE (for *rifled gun;* akin to Ger. *riefeln,* to groove), HUNTING. The hunting rifle antedated the military rifle and until the opening years of the twentieth century was clearly the superior of the two weapons in point of accuracy and general ballistic efficiency. The rifle of the early American colonists was accurate enough for hunting purposes up to about 150 yards, while Brown Bess, the smoothbore musket of the Revolutionary days, could not be depended upon beyond 60 or 70 yards. Indeed it is recorded that at a match in England in 1792 between a bow and a musket at 100 yards, the bow won easily.

The origin of the rifle principle—a spirally grooved bore which imparts a spinning motion to the ball propelled through it—seems never to have been clearly established. Evidently these grooves were at first cut in lines parallel with the line of the bore, and it seems probable that they were originally intended to lessen the fouling of the bore due to the imperfect combustion of the powder, since the grooves would accommodate some of this ash, thereby permitting the ball to come into contact with the barrel. The spiral grooving probably was a development of this expedient, and may have been suggested by the whirling motion of a properly feathered arrow.

Apparently the earliest definite record of a rifle proper is contained in an inventory, dated 1476, of the fortress of Guastella, near Parma, Italy. This inventory mentions specifically a weapon with a spirally grooved bore. Other records indicate the use in Europe of the weapon with straight grooves towards the close of the fifteenth century, e.g., at Vienna and at Leipzig (1498).

The first rifles to be made in America were manufactured by Swiss colonists (from the Canton of Basel) in what is now Lancaster Co., Pa., as early as 1721, according to A. C. Buell's *History of Andrew Jackson.* There seems to be some reason to doubt the accuracy of this date, however, and it is more probable that these rifles were weapons (of the old Yager type) which had been brought to America by the colonists. But Governor Thomas Pownall, of New Jersey, mentions definitely the existence of a rifle factory in the present Lancaster County of Pennsylvania in 1754. This early Swiss-American rifle fired an ounce ball and had a barrel from 30 to 32 inches long, with grooves which turned about one-half of one revolution in the entire length of the bore. Rifles somewhat modified from this type were used in the Revolutionary War, though Brown Bess, the smoothbore musket, was the characteristic military hand firearm of those days. See SMALL ARMS.

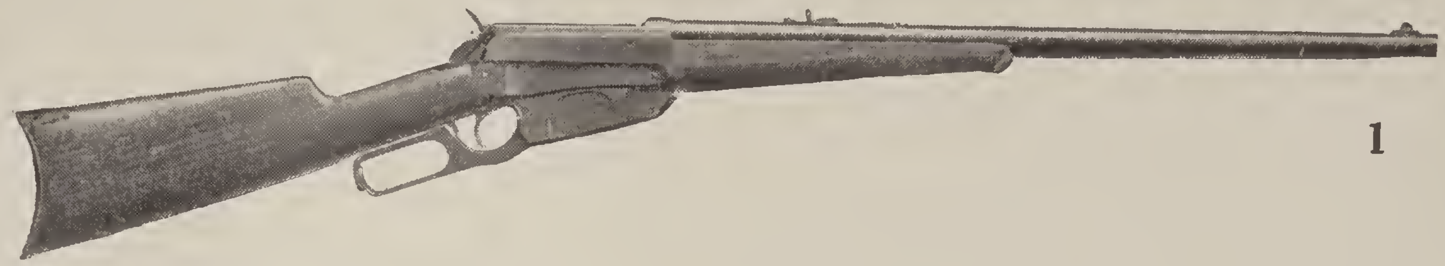
Muzzle-loading hunting rifles may be said to have been perfected in America during the half century preceding the Civil War, when a rifle was developed which had a comparatively flat trajectory and was very accurate up to about 500 yards. As a matter of fact this type of rifle showed the highest degree of ballistic efficiency ever attained by any hand firearm using black powder. The breech-loading rifle began to be comparatively common in the United States about 1865. At the close of the Civil War some of the Federal troops were regularly armed with Henry, Sharp, and Spencer rifles, all breechloaders; and the Henry, a lever-action repeater, was the progenitor of the modern repeating rifle of that type. All these weapons at first had comparatively weak breech mechanisms, and being unable, for that reason, to withstand the strain of heavy charges, were actually inferior in accuracy and range to the better class of muzzle-loaders. Once this dangerous defect was corrected, the newer rifle rapidly displaced the older one and incidentally led to the development of several hundred different sizes of black-powder cartridges, most of which are now virtually obsolete.

Then came the magazine or repeating rifle, loaded by hand-worked mechanism and represented now by three different types of loading devices, the lever action, the pump or trombone action, and the bolt action. These weapons are equipped with tubular, box, or revolving magazines. The Winchester Repeating Arms Company produced in 1866 a lever-action repeater with a tubular magazine (under the barrel) which held several cartridges. Moving forward the finger lever drew back the breech bolt, thus forcing back and cocking the hammer and ejecting the discharged shell. The backward motion of the lever closed the breech bolt and inserted a new cartridge in the chamber. This is essentially the lever action of the modern tubular magazine rifle.

The trombone or pump action functions in much the same manner as far as the internal mechanism is concerned, but it is actuated by means of a sliding sleeve arranged immediately in front of the trigger guard, and is therefore operated with the left hand—by the man who shoots from his right shoulder. The bolt action is operated by drawing the breech bolt back and pushing it forward into place again, the two motions extracting the empty shell and reloading and recocking the piece.

Of these three mechanisms the bolt action is probably the most durable, and it certainly is the simplest, as in some of its forms the entire breech bolt may be removed without the assistance of tools, a distinct advantage in case the action becomes clogged or when the rifle needs cleaning. But it cannot be operated as rapidly as the lever action, which may be worked without removing the piece from the shoulder. On the other hand the bolt action has the advantage of having the hammer concealed, and a safety catch device, which greatly lessen the chances of the accidental discharge of the piece. This danger is more or less present, especially in thick brush, when the hammer is exposed, as it is in American lever-action rifles, excepting the Savage hammerless weapon, which carries the hammer mechanism within the

HUNTING RIFLES



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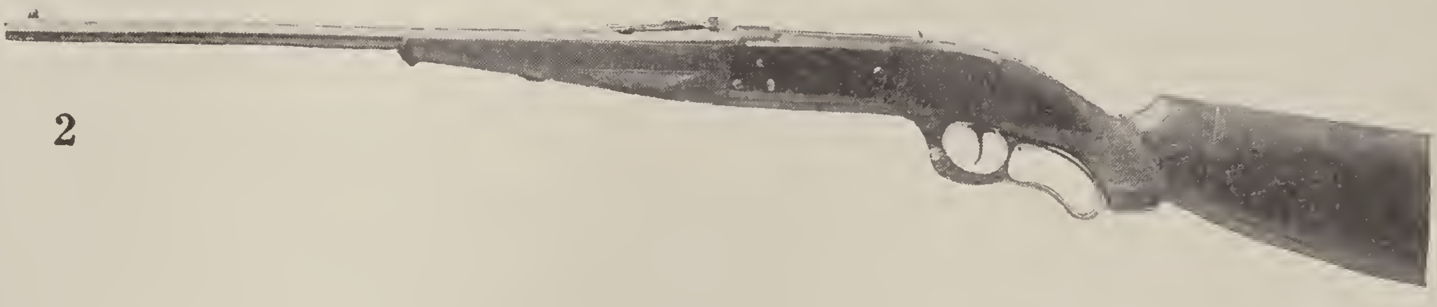

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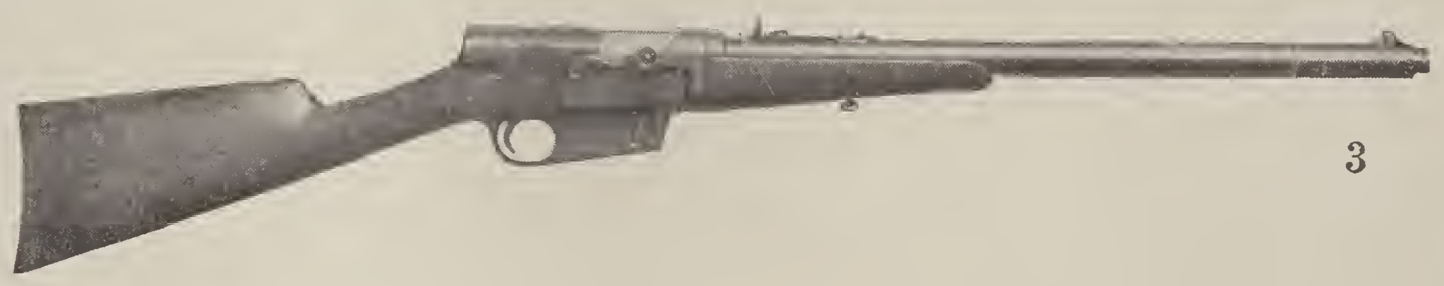

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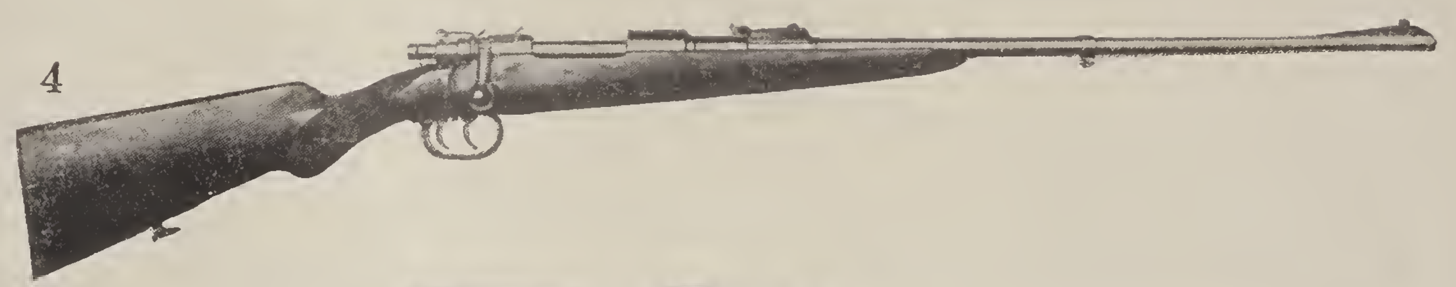

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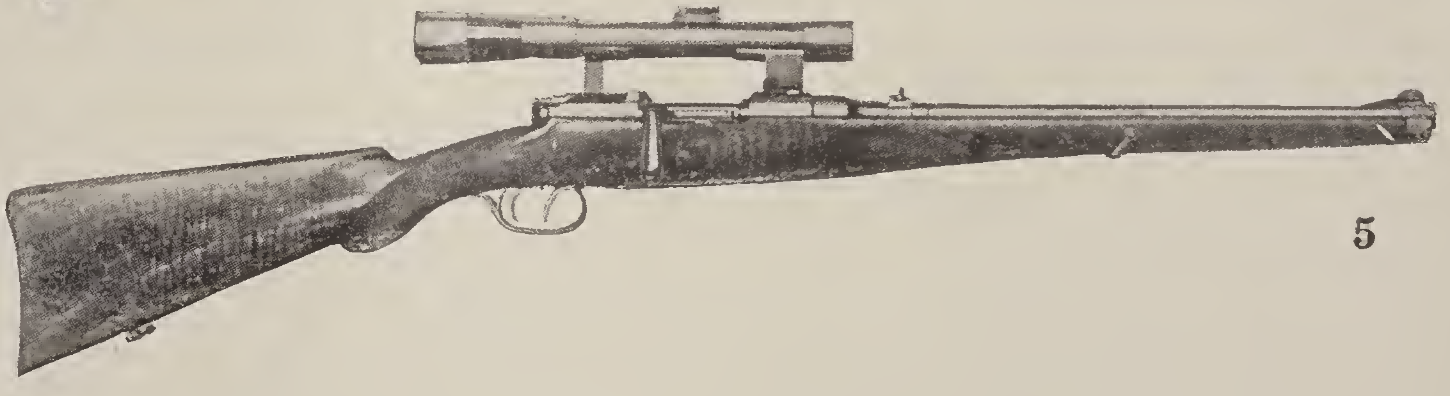

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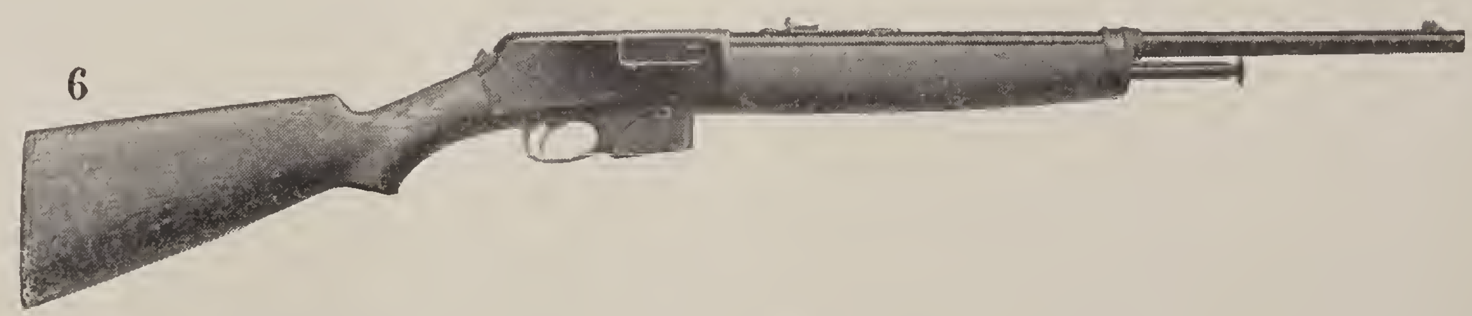

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1 Winchester .405 Calibre, 5-Shot Rifle. Lever Action
2 Savage .250 Calibre 6-Shot Rifle. Hammerless Lever Action
3 Remington 35 Calibre 6-Shot Auto-Loading Rifle
4. Mauser 6-Shot Rifle. Bolt Action
5. Mannlicher-Schoenauer 6-Shot Rifle. Bolt Action. Equipped with Telescope
6. Winchester .401 Calibre, 6-Shot Self-Loading Rifle

breech bolt. The pump action is the most rapid of all hand-worked mechanisms in its functioning, and is the type most commonly used in very small-calibre rifles, especially the .22, but it has not thus far found permanent favor for big-game rifles.

Of the three kinds of magazines, either the box or the revolving type is generally considered preferable to the tubular (which is confined to the lever-action or pump guns), especially where the tube is exposed so that it may receive a blow which might cripple the weapon as a repeater. Furthermore, the balance of a tubular magazine piece, especially when the tube extends under the entire length of the barrel, changes appreciably as the cartridges are withdrawn. And finally, this type of magazine in its present form cannot with safety be used for the modern, sharp-pointed (Spitzer) bullet, because this point lies against the primer of the cartridge ahead. None of these disadvantages apply to the revolving or box magazines, which carry the cartridges side by side, though a box that protrudes below the frame makes the piece somewhat awkward to handle.

The latest development of the hunting rifle is the automatic or, to use a more precise term, the self-loading weapon, of which several types are produced in the United States. In the Winchester rifle of this type the breech bolt is actuated by the recoil at the moment of the discharge of the arm, with the result that the empty shell is ejected, a loaded one inserted in the chamber, and the piece recocked. In the Remington the recoil is employed to slide the entire barrel, which movement accomplishes the reloading and recocking operations. In the Standard the gas from the combustion of the powder is taken into a tube under the barrel through a small port near the muzzle, after the bullet has cleared the gun. The gas acts on a piston which operates the reloading device. In each case the reloading is accomplished very quickly, so that the piece may be fired with great rapidity. On the other hand it is to be said that thus far these rifles have not been adapted to the most powerful cartridges; that their mechanism is necessarily more delicate than is that of the ordinary repeater, and that conservative sportsmen are inclined to discountenance the use of such weapons, except in the hunting of the most dangerous and aggressive animals.

To the improvement of rifle ammunition rather than of rifle mechanism is chiefly due the remarkable increase in the efficiency of the hunting rifle during the past 20 years. The introduction of smokeless powder (see SMOKELESS POWDER) in a reliable and durable form caused the appearance of an entirely new type of arm, the small-calibre, high-power rifle. The ballistic principles upon which this new weapon was developed are discussed in the articles SMALL ARMS and BALLISTICS, but it is proper to explain here that the slower combustion and greater efficiency of smokeless powder made possible rifling of a sharper pitch (see ORDNANCE) and that the two combined imparted to the small, hard-metal-jacketed bullet far greater velocity and striking power than had been developed for hunting ranges by black powder and the much heavier lead ball. The shocking power of this new missile was insured by leaving the lead core exposed at the point, so that the bullet expanded or mushroomed upon striking tissue even of the softest kind and in that form created a very severe wound.

Because of its greatly increased velocity the trajectory, or curve, described by a bullet fired from a modern high-power rifle, is much flatter than is that of a bullet fired from the old-style black-powder weapon. The effect is, of course, greatly to increase the range within which no allowance need be made for the rise or fall of the bullet, which is a decided advantage to the hunter.

The most recent and in some respects the most remarkable improvement in hunting-rifle ammunition has been effected by the adoption of the sharp-pointed or so-called Spitzer bullet, driven at a very high velocity by a heavy charge of nitrocellulose or some similar powder. Reference has already been made to the high efficiency attained by the best type of muzzle-loading rifle. This efficiency was due primarily to the form of the bullet, which was of the pointed or sugar-loaf type and was carefully introduced into the bore by means of a false muzzle. But because of its short base this bullet could not be seated securely in the first cartridges to be made for breechloaders, and it therefore disappeared with the muzzle-loader. The sound ballistic principle of the slowly tapering missile now reappears in the long and sharply pointed Spitzer bullet, with the remarkable results just referred to. For it seems to be clearly established, not only that much higher velocities and increased accuracy are obtainable with this bullet, but also that if it be traveling at a speed of not less than 2000 feet a second when it strikes, it has an explosive effect upon the tissue which imparts a terrific shock even to such great beasts as the rhinoceros and the elephant. Though this type of bullet is also made with the lead core exposed, so that it will expand upon impact, its shocking and rending effects are clearly observable when the full metal jacket is used. This effect, however, apparently cannot be assured unless the bullet be moving at the moment of impact at or very near the velocity mentioned—2000 feet a second—and the charges of powder at present employed do not insure that velocity beyond about 300 yards, which, however, is well within the normal hunting range. At a lesser velocity the full-jacketed Spitzer bullet simply penetrates the tissue without greatly damaging it, and with comparatively little shock.

The selection of a hunting rifle will of course be determined chiefly by the size and vitality of the game upon which it is to be used, but a few general principles may be stated. The ordinary .22-calibre short cartridge should be used only for target practice and for vermin, rats and the like. For gray, black, and fox squirrels, rabbits, and the smaller mammals generally, the cartridge should not be lighter than the .22 long rifle; while for turkeys, geese, and such mammals as the woodchuck, fox, and coyote, a cartridge of the .25-35 type is about right. In 1912 the Savage Arms Company, of Utica, N. Y., produced a remarkable rifle, whose specially loaded cartridge propels a soft-nose bullet .228 inch in diameter at a velocity of 2800 feet a second and develops a theoretical striking energy of 1206 foot pounds. This rifle is plenty powerful enough for the smaller deer, but for the larger members of that family, i.e., the moose, the caribou, and the elk, and for the large bears, the rifle should have at least the striking power of the .303 Savage, the .30-30 Winchester, and other weapons of that class, while many hunters prefer much more powerful rifles, like the .405 Winchester, for these large mammals, especially the bears.

The highest development of the Spitzer bullet type of ammunition mentioned above appears to be the cartridge employed in the Savage .250-calibre, six-shot repeating rifle, produced in 1915. This weapon, which weighs only seven pounds, develops the extraordinary muzzle velocity of 3000 feet a second, and the maximum trajectory is only 2.315 inches in 200 yards. The bullet weighs 87 grains, is of the expanding type, and is equipped with a copper jacket, or it may be had in the full-jacketed form. The rifle is declared to be powerful enough for the largest American game. The types of rifles best adapted to African and Asiatic hunting are mentioned in the article HUNTING BIG GAME.

The sighting of a hunting rifle is a highly important matter and should receive careful attention. The best type of front sight is a gold (alloy) or ivory bead, which can be seen plainly in dim lights. Any bright-metal sight should be avoided because of its tendency to reflect strong light, thereby making it difficult if not impossible to tell where the precise middle of the sight is. If an open rear sight is used it should be a straight or only slightly hollowed-out bar, with a small notch. The common clover-leaf or buckhorn rear sight is a bad form, because it obscures the view unnecessarily and is likely also to reflect strong light on its sides. The aperture sight of the Lyman type, attached to the tang not more than 2 inches from the eye, is an efficient form, especially for the hunter whose vision is impaired by astigmatism or myopia. The telescope sight is of much assistance in making long shots, but the instrument selected should be of a kind which can be quickly attached and detached, and it should not have a magnifying power of more than four diameters, as greater strength makes difficult the holding of cross hairs on the mark. See SIGHTS.

For high-power rifles the shotgun butt is generally preferred to the rifle or crescent-shaped butt, though the latter form can be held more securely to the shoulder during rapid firing with a lever-action weapon. The utmost pains should be taken to clean very thoroughly any rifle using smokeless powder as soon as possible after it has been fired. For the bore a strong nitro-solvent oil should be used, as ordinary oil will not remove the corrosive residue, and these deposits will soon ruin the barrel.

Consult Horace Kephart, *Sporting Firearms* (New York, 1912), and Charles Askins, *Rifles and Rifle Shooting* (ib., 1912), both excellent discussions; also Ommundsen and Robinson, *Rifles and Ammunition* (ib., 1915).

RIFLE, MILITARY. See SMALL ARMS.

RIFLE, SPORTING. See RIFLE, HUNTING; SMOKELESS POWDER.

RIFLEBIRD, or RIFLEMAN. An Australian bird of paradise (*Ptiloris paradisa*), with a long curved bill and in size about equal to a large pigeon. The upper parts are velvety black, tinged with purple; the under parts velvety black, diversified with olive green. The crown of the head and the throat are covered with innumerable little specks of emerald green, of most brilliant lustre. The tail is black, the two central feathers rich metallic green. The female is much more plainly colored. The name was given by early Australian settlers in allusion to the resemblance between the plumage of the male bird and the uniform of one of the familiar rifle brigades.

RIFLEMAN and **RIFLE CORPS.** Formerly, the term "rifleman" designated an infantry soldier so armed and equipped as to be capable of greater mobility and more effective marksmanship than was possible with the ordinary infantry soldiers of the line. Modern conditions, however, demand that all regiments alike possess these qualities, so that, with the exception of uniform, the rifleman of to-day differs in no material way from his comrade in the line. Throughout the armies of Europe the rifle regiments are dressed in uniforms of black, dark green, or some other shade of inconspicuous color. In England the Rifle Brigade, King's Royal Rifles, Irish Rifles, and Scottish Rifles (see CAMERONIANS) constitute the entire rifle establishment of the regular army, and are all distinguished by their dark-green uniforms, varied only by the facings or by the tartan trews of the Cameronians. The term "rifleman" is frequently used as being synonymous with "sharpshooter" (q.v.), but such is no longer the case. When in 1779 the volunteer citizen soldier became an integral factor in English national defense, he was spoken of as a rifleman and his regiment as a volunteer corps. His uniform was gray, the particular shade of which has since been known as rifle gray.

In the United States army the preëminent characteristics of the soldier, whether mounted or dismounted, have ever been those of the rifleman. In the regulations the words "expert rifleman" are used officially to designate the highest grade of marksmanship, the grades being expert rifleman, sharpshooter, marksman, first-class man, second-class man, unqualified. Rifleman's insignia are, for a marksman, a pin; for a sharpshooter, a silver badge; for an expert rifleman, a silver badge. The mounted rifleman was a product of comparatively recent military development. See INFANTRY, MOUNTED.

RIFLING. See ORDNANCE; SMALL ARMS.

RIFT VALLEY. A depression in the earth's crusts formed by a vertical displacement of the strata. In some instances there is a single line of displacement, along which the strata on one side have been depressed, but quite often there are a series of faults running in parallel directions and dividing the strata into blocks which show the effects of differential movement. The depressions thus formed may be occupied by rivers or lakes, and in time they lose their characteristic sharp contours, taking on the appearance of ordinary erosional valleys. Rift valleys are common in mountainous districts all over the world.

RIG, OF A VESSEL. See SHIP.

RIGA, rē′gȧ. A seaport of Russia, capital of the Government of Livonia and the seat of the Governor-General of the Baltic Provinces, situated on the Düna, about 10 miles above its mouth, in the Gulf of Riga, 363 miles southwest of St. Petersburg (Map: Russia, B 3). The old town on the right bank of the Düna has the appearance of a mediæval German town, while the suburbs, which contain the bulk of the population, are largely modern. Riga possesses comparatively few ancient buildings. There may be noted the Domkirche, founded originally in the thirteenth century, but rebuilt in the sixteenth and containing one of the largest organs in the world, and the church of Saint Peter, with a spire 440 feet high.

The castle, now the residence of the Governor-General and seat of the administration, the house of the old association of the Black Heads, the house of the Knights (Ritterhaus), the exchange, the guild houses, and the theatre may also be mentioned. Riga is well provided with educational and charitable institutions. It has a polytechnicum with about 2100 students, a seminary for priests, a school of navigation, a municipal museum, and a library with over 99,000 volumes. It occupies the third rank among the seaports of Russia and the second among the Baltic seaports, next to St. Petersburg (Petrograd).

The chief manufactures are machinery, railway cars, lumber, leather, candles, tiles, glass, tobacco products, etc., the annual value of its manufactures exceeding $30,000,000. The principal harbors of Riga are those at the mouth of the Düna and the Mühlgraben, nearer to the city. Lighter craft go up to the city by the canalized river. The harbor is frozen for a considerable part of the year and is not well protected. Imports and exports in 1912 were valued at $51,127,000 and $110,480,000 respectively; average for the five-year period 1907–11, $38,935,000 and $79,443,000. The principal exports are cereals, flax and flaxseed, eggs, hides and skins, and lumber; and the chief imports, machinery, cotton, coal, and groceries. The estimated population rose from 169,329 in 1881 to 318,400 in 1908 and 334,600 in 1913. About 47 per cent of the population is German.

Riga was founded by Albert I, Bishop of Livonia, in 1201. An episcopal see was established here, which soon was erected into an archbishopric. The town attracted many colonists from Germany on account of the commercial privileges granted to it by its founder, and became in 1282 a flourishing member of the Hanseatic League. Its burghers were involved in conflicts with the archbishops, who sought to hold the city under their temporal power, and with the Teutonic Knights. About the middle of the sixteenth century Riga passed into the possession of the King of Poland. Soon after the archbishopric was abolished. In 1621 the city was taken after a long siege by Gustavus Adolphus of Sweden. It passed to Russia in 1710. It was bombarded by the French in 1812 and blockaded by the English in 1854. During the European War which began in 1914 it formed the objective of many German military moves because of its strategic position with reference to Petrograd. See War in Europe. Consult: Neumann, *Das mittelalterliche Riga* (Berlin, 1892); Tobien, *Ergebnisse der Rigaer Handelstatistik, 1866–91* (Riga, 1893); Mettig, *Geschichte der Stadt Riga* (ib., 1895); *Der Stadt Riga* (ib., 1901).

RIGA, Gulf of. An inlet of the Baltic Sea, extending in a southerly direction between the governments of Esthonia, Livonia, and Courland (Map: Russia, B 3). It is about 100 miles long and over 70 miles wide. Its water is less salty than that of the Baltic Sea. The gulf never freezes over entirely and is ice free for about two-thirds of the year along the coast. At its southeastern corner it receives the river Düna. At the entrance to the gulf lie the islands of Oesel, Dago, and Mohn.

RIG′ADOON′ (Fr. *rigodon, rigaudon,* said to be named after *Rigaud,* a French dancing master). A lively dance of French origin. It was popular in the time of Louis XIII, and was introduced into England towards the last of the seventeenth century. The rigadoon had an unusual jumping step, and the music, in $\frac{2}{4}$ or common time, was spirited.

RIGAS, or **RHIGAS**, rē′gäs, Konstantinos (1754–98). A Greek patriot and poet, born at Velestinos (ancient Pheræ). Until 1790 he was in the employ of the Hospodar of Wallachia and then, joining the revolutionary party, attempted first to form an anti-Turkish committee in Vienna and then at Venice to influence Bonaparte in behalf of Hellenic independence. He was imprisoned by the Austrians and surrendered to the Turks, who executed him at Belgrade. His collected songs were published in 1814, and the Greek paraphrase of the *Marseillaise* is attributed to him.

RIGAUD, rē′gō′, properly Rigaud y Ros, Hyacinthe (1659–1743). A French portrait and historical painter of Spanish descent. He was born at Perpignan and studied at Montpellier under Pezey, Verdier, and Ranc. After a sojourn in Lyons he went to Paris in 1681 and won the Prix de Rome at the Academy the following year. He rapidly attained European celebrity and counted among his sitters five crowned heads and all the great men of his day. The pompous dignity of the age of Louis XIV is shown by his portraits of that monarch (1701) and of Bossuet, in the Louvre, and of the Marquis Dangeau, at Versailles. Rigaud painted with affectation in externals, but with great skill and absolute truth, and his less formal portraits, such as those of his mother, Marie Serre (1695), of the Duke de Lesdiguières, and of Robert Cotte, all in the Louvre, rank among the masterpieces of French art. Rigaud became a member of the academy in 1700. Consult O. M. Hueffer, in *French Art from Watteau to Prud'hon* (London, 1905).

RIGAUD, Philippe de. See Vaudreuil, P. de Rigaud, Marquis of.

RIGAUD, rē′gō′, Stephen Peter (1774–1839). An English astronomer and historian of mathematics. He was born at Richmond in Surrey, of parents who were Huguenot refugees, and was educated at Exeter College, Oxford, where he became lecturer on experimental philosophy and Savilian professor of geometry in 1810. He succeeded his father as observer to the King at Kew (1814) and followed Abraham Robertson as Savilian professor of astronomy in 1827. In Radcliffe Observatory, which came under his charge at this time, he discovered important manuscripts of Bradley and of Harriot and many other papers. Rigaud published: *The Miscellaneous Works and Correspondence of Dr. Bradley,* with an important memoir (1832); *An Historical Essay on the First Publication of Newton's "Principia"* (1838); *The Correspondence of Scientific Men of the Seventeenth Century* (1841, edited by his son; reëdited by De Morgan, 1862); and many valuable monographs of historical interest in mathematics and astronomy.

RIG′BY, Elizabeth. The maiden name of Lady Elizabeth Eastlake (q.v.).

RIG′DON, Sidney (1793–1876). A Mormon elder. He was born in St. Clair Township, Allegheny Co., Pa. From 1821 to 1824 he was in charge of the First Baptist Church in Pittsburgh, but he became convinced that the Baptist doctrines were not in harmony with the

Scriptures and withdrew from the denomination with two other ministers, Alexander Campbell and Walter Scott. From these three grew a sect commonly known as the "Campbellites" (q.v.) though they called themselves "Disciples." (See DISCIPLES OF CHRIST.) In 1830 the doctrines of the Mormon church, but recently organized, were explained to Rigdon by an old friend who had become a Mormon elder, and after reading the Book of Mormon he and his wife decided to join the sect. Rigdon became a close friend of Joseph Smith (q.v.) and the two were associated as leaders of the Mormon church until a short time before Smith was killed, in 1844. When Brigham Young (q.v.) succeeded to the presidency, Rigdon was excommunicated and did not move west with the church, but returned to Pittsburgh. He never abandoned his Mormon faith. He died at Friendship, N. Y.

RIGG, JAMES HARRISON (1821–1909). An English Wesleyan Methodist clergyman, educator, author, and journalist. He was born at Newcastle-on-Tyne, was educated at Old Kingswood School, and entered the ministry in 1845. In 1868 he became principal of the Wesleyan Training College, Westminster, London. He was English correspondent of the New York *Christian Advocate*, and for several years was on the staff and afterward became sole editor of the *London Quarterly Review*. His works include: *Wesleyan Methodism and Congregationalism Contrasted* (1852); *Modern Anglican Theology* (1857, 1859, 1880); *The Churchmanship of John Wesley* (1868, 1878, 1886); *National Education in its Social Conditions and Aspects* (1873); *The Living Wesley* (1875, 1891); *Dr. Pusey: His Character and Life Work* (1883); *Oxford High Anglicanism and its Chief Leaders* (1895, 1899).

RIGGED MARKET. See STOCK EXCHANGE, *Stock Exchange Terms.*

RIG'GING (from *rig*, from Norw., dialectic Swed. *rigga*, to rig; probably connected with AS. *wrēon*, ONorthumb. *wrīa*, archaic Eng. *wry*, to cover). The rigging of a vessel includes all the ropes and chains used to support or operate her masts, yards, booms, gaffs, sails, etc. It is of two kinds, standing rigging and running rigging. The former is semipermanent and consists chiefly of supports to the masts, such as shrouds, stays, backstays, etc. When once in position these are not moved except when they require slight adjustment or renewal. Yards, gaffs, and booms have some standing rigging for their support or for other purposes. Standing rigging is usually of wire or hemp rope; if the former it is commonly painted, or galvanized, or both; if of hemp it is tarred. For further preservation standing rigging is parceled (wrapped with tarred or painted canvas) and served (wrapped closely with marline or spun yarn). The running rigging of a ship comprises the moving or movable ropes which are used to operate the yards, gaffs, booms, and sails, or to raise and lower the upper masts, hoist weights, and the like. Such ropes are chiefly of manila fibre, but some are of untarred hemp or cotton and others of flexible wire or chain. The most important ropes of the running rigging are the braces (used to swing the yards or keep them properly pointed), the halyards (used to hoist the yards or sails), and the gear attached to the sails such as sheets, clew lines, buntlines, etc. See SAIL; SHIP.

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